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AN EXPERIMENTAL STUDY OF DIFFERENT METHODS OF ARTIFICIAL RESPIRATION

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Two articles have appeared recently (Cordier, 1943; Eve, 1943) in which the criteria of efficiency of different methods of artificial respiration have been discussed. The aim of all methods of artificial respiration is agreed upon—it is the maintenance of respiratory exchanges in the nervous system. For this to take place two fundamental requirements must be fulfilled: (*a*) adequate pulmonary ventilation; (*b*) transport of respiratory gases from and to the lungs. Cordier devotes attention to the first of these fundamentals, while admitting the importance of the other, and reviews the experimental evidence for the claims of efficiency made for Schäfer's, Silvester's, and the rocking (Eve's) method. He concludes, basing his judgment on lung-ventilation measurements, that the rocking method is not necessarily superior to other methods despite the claims which have been made for it. Eve reiterates the claim (Killick and Eve, 1933) that lung ventilation with the rocking method is equal to that with Schäfer's when measured in a normal subject voluntarily suspending respiration. It is also argued, chiefly on theoretical grounds, that the rocking method is likely to have a more beneficial effect on the circulation than Schäfer's method would have. Both authors, however, stress the necessity for further investigation into the effects of artificial respiration on the circulatory system and the transport of oxygen. Such investigations were actually in progress at the time of publication of those articles, and a preliminary account of them is given in the present paper.

It has been assumed that the fundamental fact to be considered in assessing the value of methods of artificial respiration is the amount of O_2 which can be transported to and used by the tissues. Accordingly, the rates of O_2 uptake, tidal air, ventilation volume, arterial blood pressure, and cardiac output have been measured with different methods of artificial respiration.

The Animal Preparation

One of the greatest obstacles to the experimental investigation of methods of artificial respiration is the lack of a suitable experimental subject. Because methods of artificial respiration are usually required for their application to man, the human subject is the most desirable. But the use of an individual voluntarily suspending his respiration, or rendered apnoeic by voluntary hyperpnoea, is attended by many objections, which have been discussed by Haldane and Priestley (1935), Henderson and Turner (1941), and Cordier (1943), amongst others. The rigidity of the ordinary cadaver makes it an unsuitable subject, and it is easier to suggest the employment of the warm non-rigid cadaver of a previously healthy individual than to undertake it; nor is it possible to investigate circulatory conditions in these circumstances. Anaesthesia carried to the point of depressing the activity of the respiratory and vasomotor centres would appear to give an ideal condition for experiment, and Waters and Bennett (1936) and Macintosh (1943a) have recently described a near approach to it in experiments in which anaesthetized persons were rendered apnoeic, by forced ventilation, for a sufficiently long period to allow tidal air volumes to be measured under different methods of artificial respiration.

Since there did not appear to be any methods by which a suitable human subject could be employed for periods long enough to enable extensive measurements to be made on the cardiovascular system, it was decided to use dogs, either with a spinal transection made between the first and second cervical segments, or deeply anaesthetized with nembutal so that the medullary centres were inactive. For the latter preparation nembutal (1% solution in isotonic saline) was injected intraperitoneally until respiration ceased and arterial blood pressure fell to 50–60 mm. Hg. In either case artificial respiration was maintained by a pump except when manual methods were being investigated. Preparations of this type can be kept in good condition over long periods by artificial respiration, and it is considered that they offer good opportunities for comparing the efficacy of different methods of artificial respiration. The medullary centres are inactive and muscle tone is low.

Measurement of Tidal Air and Rate of O_2 Uptake

Rates of O_2 uptake and volumes of tidal air were obtained by a recording spirometer. A Y-shaped cannula was tied into the trachea and a positive-pressure artificial respiration pump could be switched in or out of the spirometer circuit by a system of taps.

Methods of Artificial Respiration Employed

(*a*) *Pump Respiration.*—This was instituted immediately before making the spinal section or inducing deep anaesthesia, and the pump stroke was adjusted to give what appeared to be the normal ventilation volume, except when experimental procedures were being undertaken. The usual rate of the pump was 10.8 strokes a minute.

(*b*) *Abdominal Pressure Respiration (Schäfer).*—The deep thorax of the average dog makes it an unsuitable subject for "prone-pressure" artificial respiration in the orthodox fashion; the prone pressure was unsuitable also for some of the experimental procedures undertaken. But with the dog supine, very firm pressure can be effectively applied to the abdomen and the viscera driven towards the thorax. It is considered that supine-pressure artificial respiration applied in this fashion is quite effective by comparison with prone-pressure respiration, and was abandoned (Schäfer, 1907–8) largely because of the danger of injury to the liver.

(*c*) *Rocking Method of Artificial Respiration.*—The animal was firmly strapped to a board by its limbs and stops were placed above and below the shoulders to prevent sliding. Rocking was carried out symmetrically about a horizontal axis through the centre of the board. The angle of rock was measured from the horizontal. A rate of 8 to 10 respirations a minute was usually maintained. So far as was possible the movement was made with a constant velocity, and stopping and starting was done fairly abruptly.

Measurement of Arterial Blood Pressure

Arterial blood pressure was recorded from the carotid or femoral artery. Changes of pressure in the recording system due to alteration of the position of the cannula when rocking was instituted were avoided by using a compensating device.

Measurement of Cardiac Output

Application of the Fick Principle.—Cardiac output was calculated from the formula:

$$\text{Cardiac output (ml./min.)} = \frac{O_2 \text{ uptake (ml./min.)}}{\text{Arteriovenous } O_2 \text{ diff. (ml./100 ml.)}} \times 100$$

The arteriovenous O_2 difference was obtained from analysis of blood samples obtained by arterial and right ventricular puncture. Analyses were made in the van Slyke manometric apparatus. Right ventricular puncture was abandoned after a few experiments because of the technical difficulties during rocking, and subsequently samples of mixed venous blood were obtained by a catheter introduced through

the external jugular vein into the right atrium. Recently a photo-electric cell device, operated on the principle of Kramer (1935) and Pappenheimer (1941), has been used for the estimation of the arterio-venous O_2 difference. It has the advantage that 2–3 ml. of blood is withdrawn only temporarily from the circulation and long series of estimations can be made.

Observations

Effect of Spinal Section on Rate of O_2 Usage.—After spinal section or the induction of deep anaesthesia the rate of O_2 uptake was usually reduced by 25–30%, and the arterial blood pressure had fallen to 40–50 mm. Hg when measurements were made 30–40 minutes later. These points are illustrated by Fig. 1.

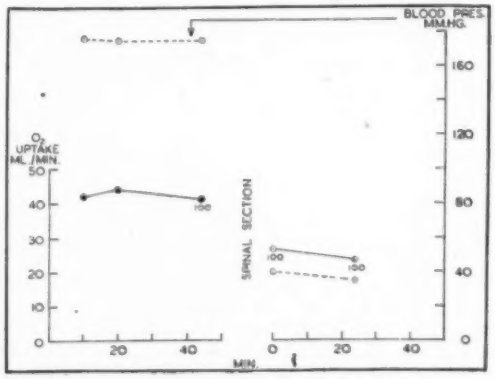

FIG. 1.—Rates of oxygen uptake and arterial blood pressure in an animal before and after spinal section.
●——● Natural respiration. ⊙——⊙ Pump respiration (figures under points indicate volume (ml.) of tidal air). ⊙ - - - - ⊙ Arterial blood pressure.

Relative Volumes of Tidal Air with Different Methods of Artificial Respiration.—Using the pump for artificial respiration the tidal air volume is determined, within wide limits, by the stroke of the pump and need not be further discussed. When the Schäfer and rocking methods are compared the tidal volume is usually smaller with the former than with the latter. A typical result from some preliminary experiments performed with spinal cats was: tidal air volume with Schäfer's method, 16 ml.; with rocking, 24 ml. In a longer and more satisfactory series of experiments on spinal or deeply anaesthetized dogs a similar relation has been found in the large majority of experiments. In 10 out of 11 experiments the rocking method has given the greater volume of tidal air, and, taking the mean of all the experiments, the tidal air with this method has been 54% greater than with Schäfer's. The difference between the tidal air in the two methods has been greatest when deep anaesthesia has been induced. In these circumstances muscle tone has been very low, and the forces responsible for restoring the volume of the thoracic cavity following the expiratory phase of the Schäfer have presumably been weak: the tidal air has often diminished progressively during the period of artificial respiration despite efforts to increase the expiratory pressure. Low muscular tone is not so likely to affect the volume of tidal air in the rocking method, because the diaphragmatic movements in both the inspiratory and the expiratory phases are impelled by the movements of the abdominal viscera. In this respect the experiments give support to the argument advanced by Gibbens (1942).

Comparison of Rate of O_2 Uptake with Different Methods of Artificial Respiration.—The usual course of an experiment was first to record the rate of O_2 uptake with pump respiration. This was done during two or three periods, and pump respiration was then replaced by either rocking or Schäfer's method of artificial respiration. When the necessary observations had been made pump respiration was reinstituted, and after this the alternative method of artificial respiration was applied. In suitable preparations the whole procedure could be repeated. The results of a typical experiment are depicted in Fig. 2. The rate of O_2 uptake with pump respiration was 23–27 ml./min.; artificial respiration by rocking gave an uptake of 26.6 ml./min., and with Schäfer, 16.8 ml./min.

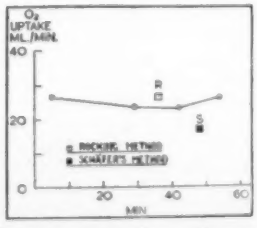

FIG. 2.—Rates of oxygen uptake. Comparison of artificial respiration carried out by pump, rocking, and Schäfer's method.

In some experiments the rate of O_2 uptake with Schäfer's and the rocking method has been smaller than with pump respiration, as is shown in Fig. 3, but on only one occasion has the O_2 uptake with Schäfer's method been greater than it was with rocking, although often there has been very little difference between them.

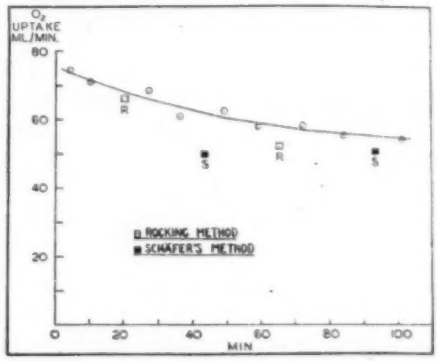

FIG. 3.—Similar experiment to that of Fig. 2, but showing gradual fall in oxygen uptake with pump respiration throughout experiment.

The Significance of Tidal Air Measurements in comparing the Efficacy of Methods of Artificial Respiration.—Cordier (1943) observes that "the determination of ventilation is only one criterion in judging the efficiency of these methods." Observations of the type given in Table I show clearly that tidal air is not necessarily the determining factor in O_2 uptake, for with very different tidal airs and ventilation volumes there may be similar rates of O_2 uptake. For in this experiment, although tidal air volumes and ventilation volumes by the Schäfer method were only about 50% of those with the rocking method, there was little difference in the rate of O_2 uptake.

TABLE I.—*Tidal Air, Ventilation Volume, and O_2 Uptake*

Period	Type of A.R.	Tidal Air (ml.)	Rate per min.	Vent. Volume (ml./min.)	O_2 Uptake (ml./min.)
1	Rocking	125	10·0	1,250	54·0
2	Schäfer	62	10·0	620	50·0
		40-minute interval			
3	Rocking	125	7·6	950	43·0
4	Schäfer	58	10·0	580	43·3

Unless the alveolar O_2 tension is allowed to fall so low that anoxic anoxia supervenes, alterations in the supply of oxygen by changing the tidal air and ventilation volume should not affect the rate of O_2 uptake. That this principle can be applied to the spinal preparation under pump respiration is shown by Fig. 4.

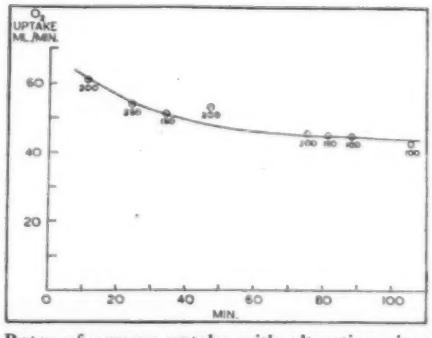

FIG. 4.—Rates of oxygen uptake with alterations in volume of tidal air in animal after spinal section. Figures under points indicate tidal air volumes (ml.).

In this experiment alterations in the volume of tidal air between 100 and 250 ml. had no effect on the rate of O_2 uptake, which fell steadily throughout the experiment. But if, in similar experiments, the tidal air was reduced below a certain volume the rate of O_2 uptake fluctuated with it, as is shown in Fig. 5. Rates of O_2 uptake were measured before spinal section at three different volumes of tidal air, and varied according to the tidal air volume. After spinal section a similar relationship held although the rate of O_2 uptake was lower, and a tidal air of 100 ml. was presumably sufficient to maintain an adequate alveolar O_2 tension.

But it has been observed, in some experiments, that alterations in the volume of tidal air, induced by changing the method of artificial respiration, have been followed by disproportionate changes in the rate of O_2 uptake. The results of such an experiment are given in Table II.

TABLE II.—*Tidal Air, Ventilation Volume, and O_2 Uptake*

Period	Type of A.R.	Tidal Air (ml.)	Rate per min.	Vent. Volume (ml./min.)	O_2 Uptake (ml./min.)
1	Pump	100	10·8	1,080	23·5
2	Rocking	94	8·4	789	26·6
3	Pump	100	10·8	1,080	23·2
4	Schäfer	73	10·0	730	16·8
5	Pump	100	10·8	1,080	25·8

The agreement between the rates of O_2 uptake during the periods of pump respiration suggests that the condition of the preparation was fairly stable, but respiration by rocking, although resulting in a slightly smaller volume of tidal air than with pump respiration, gave a higher rate of O_2 uptake. During respiration by Schäfer's method the volume of tidal air was reduced to approximately 78% of that with rocking, but the rate of oxygen uptake fell to 63%.

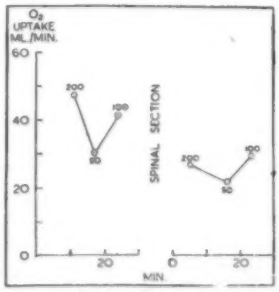

FIG. 5.—Similar experiment to that of Fig. 4, but showing changes in rate of oxygen uptake according to tidal air volume before and after spinal section.

It was clear from the results of this and similar experiments that, if the effectiveness of artificial respiration methods was to be assessed in terms of the rate of O_2 uptake, factors additional to tidal air volume had to be considered. Some experiments seemed to show clearly that the O_2 uptake varied with the tidal air; others, such as those shown in Tables I and II, pointed equally clearly to the intervention of other factors. Of these probably the most important is cardiac output, and both Henderson (1937) and Schäfer (1903) make reference to it without, however, quoting any experimental evidence. Another section of this work deals with measurements of cardiac output under different conditions of artificial respiration and with the significance of the findings.

Effect of the Angle of Rocking on the Volume of Tidal Air.—Although the volume of the tidal air should not be taken as the sole criterion of the efficacy of a method of artificial respiration, it is necessary to know how the angle of rocking affects the tidal air volume if recommendations are to be made regarding the optimum rate and angle of rocking. Killick and Eve (1933) showed that rocking to 50° in each direction gave a larger tidal air volume in a human subject voluntarily suspending respiration than rocking to 30°, and Macintosh (1943b) has recently made similar observations on an anaesthetized human subject rendered apnoeic by hyperventilation. In a dog, with respiratory activity suspended by deep barbiturate anaesthesia, the results of rocking to various angles were as shown in Table III.

TABLE III

Angle of Rock	Tidal Air (ml.)
30°	108
45°	156
55°	162

Rate of rocking, 9.5 per min.

Apparently, in the dog, the volume of tidal air is not increased significantly by rocking beyond 45° (see also Fig. 6), and since in the human subject rocking to this angle gives a tidal air similar to that in quiet respiration, it appears to be adequate for artificial respiration.

Rate and Rhythm of Rocking: (i) *Rate of Rocking.*—The effect on the tidal air and ventilation volume of rocking at various rates was determined. The results of a typical experiment were as given in Table IV.

TABLE IV

Rate of Rocking per min.	Tidal Air (ml.)	Ventilation Volume (ml./min.)
6·75	146	985
9·50	148	1,405
12·40	144	1,787
16·10	144	2,320

Angle of rock, 45°

The findings are not entirely in accordance with those of Killick and Eve (1933) on the human subject, for they reported that, although there was an increase in ventilation volume as the rate of rocking increased, the tidal volume diminished; in the experiments on the dog the tidal air volume is practically unchanged over the range of rates of rocking investigated. It seemed likely, having regard to the large ventilation volumes ensuing with high rates of rocking, that CO_2 might be "washed out" and the normal stimulus to breathing so removed. In a dog, lightly anaesthetized, it was found that a period of hyperventilation, either with a pump or by rocking, was followed by apnoea. The results of an experiment are given in Table V.

TABLE V.—*Effect of Rate of Rocking on Ventilation Volume and Induction of Apnoea*

Period	Type of A.R.	Rate per min.	Tidal Air (ml.)	Vent. Vol. (ml./min.)	Duration of A.R.	Duration of Apnoea (sec.)	Rate of O_2 Uptake (ml./min.)
1	Natural	8·25	146	1,203	—	—	82·0
2	Pump	39·00	200	7,800	125	87	—
3	Rocking	9·50	145	1,378	163	0	79·0
4	,,	12·40	156	1,935	135	20	82·6
5	,,	16·10	166–146	2,510	145	27	86·7

From the preceding considerations it is obvious that the ventilation volume while rocking should not exceed the normal resting volume if the danger of acapnia is to be avoided; with the human subject, if the usual volume of tidal air in the rocking method is taken as 500–600 ml., the rate should not exceed 10 a minute.

(ii) *Rhythm of Rocking.*—The rhythm of rocking—i.e., the ratio between the duration of the inspiratory and expiratory phases—does not appear to be important in considering ventilation volume provided each is long enough to allow entry or exit of an adequate volume of air. The point will be discussed further, however, in connexion with the circulatory effects.

Effects of Artificial Respiration on Cardiac Output.—The object of any method of artificial respiration should be to maintain or increase the flow of well-oxygenated blood, at a suitable CO_2 tension, through the tissues of the body and, in particular, the brain. Although there is evidence of some vasomotor control of the cerebral vessels in the conscious or the lightly anaesthetized animal (Forbes and Cobb, 1938) it is likely in such cases, and almost certain when the respiratory and vasomotor centres have failed, that the cerebral flow is governed chiefly by the systemic blood pressure and, *ceteris paribus*, this will be determined by the cardiac output. The results of a typical experiment in which the effects on the cardiac output of artificial respiration by positive-pressure pump, rocking, and Schäfer's method, respectively, were compared are given in Table VI.

TABLE VI

Period	Type of A.R.	Tidal Air (ml.)	O_2 Uptake (ml./min.)	Blood O_2 (ml./100 ml.)			Cardiac Output (ml./min.)
				Art.	Ven.	Arterio-ven. Diff.	
1	Pump	150	61·1	—	—	—	—
2	,,	150	63·3	17·3	12·1	5·2	1,219
3	Rocking	104	60·9	16·7	11·7	5·0	1,218
4	Schäfer	75	53·8	16·7	11·2	5·5	979
5	Pump	150	56·4	—	—	—	—

In three successive experiments of this type the cardiac output with rocking was greater than with Schäfer's method, however vigorously the latter was applied (in one experiment post-mortem examination showed that the liver had been ruptured!); but the changes in cardiac output should not be considered alone but in conjunction with the accompanying alterations in the saturation of the venous blood. This was highest during rocking and lowest during the application of Schäfer's method. In general, the cardiac output, measured during relatively short periods of artificial respiration (5–10 min.) to give accuracy in comparison, has been about 25% greater with rocking than with the abdominal-pressure method.

Having established the superiority, under the given experimental conditions, of the rocking method in its effect on cardiac output, further inquiry was made into the effect of prolonged rocking, and of rocking to various angles. The results of an experiment are represented in Fig. 6. Measurements for the assessment of cardiac output were first made during a period when the animal was under light nembutal anaesthesia. The anaesthesia was then deepened until the respiratory centre was completely depressed, and artificial respiration by the pump was instituted. During this stage the cardiac output was reduced to less than half of what it had been previously under light anaesthesia. Rocking was then started and maintained for 52 minutes, and the cardiac output compared at angles of rock of 30°, 45°, and 55°. Taking the output when the rocking angle was 45° as a standard for comparison, it is clear that the cardiac output increased steadily during the period; but the final response,

when rocking to 55°, indicates that the maximum output had been almost reached. It is important to notice, in assessing the effectiveness of the artificial respiration, that the output at the end of the rocking period and immediately before returning to pump respiration was only 17% less than during light anaesthesia. The rapid decline in the cardiac output to below the pre-rocking level when pump ventilation was restored shows that the increase in cardiac output was due solely to the rocking. The impossibility of assessing the effectiveness of artificial respiration solely by measurement of tidal air volume is also illustrated; for although, with one exception, the volume when rocking was less than the stroke of the pump, the cardiac output was almost double that with pump respiration.

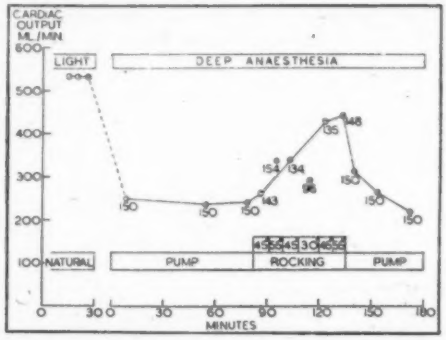

FIG. 6.—Effect on cardiac output of prolonged rocking and of rocking to various angles. Rocking to 30°, 45°, 55° for the periods indicated on the graph. Figures under points indicate tidal air volumes (ml.).

The percentage oxygen saturation of the mixed venous blood immediately before rocking was 46; at the end of the rocking period it had risen to 73, but 30 minutes after the cessation of rocking it had fallen to 53. Referred to a typical O_2 dissociation curve for dog blood at 40 mm. Hg CO_2 tension (E. Neil), these percentage saturations are found to correspond to oxygen tensions of 28.5, 47, and 32 mm. Hg respectively, and the effect of an increased cardiac output in providing a higher unloading tension of oxygen is demonstrated.

Discussion of the Effects of Artificial Respiration on the Circulation and of the Rhythm of Rocking for Maximal Cardiac Output

Only brief consideration can be given to the ways in which the methods of artificial respiration examined—Schäfer, rocking, and pump—affect the circulation. In each case the movements of the body wall and the diaphragm are passive; they are not due to muscular activity. In Schäfer's method the abdominal cavity and contents are alternately compressed and released. During compression the venous return is augmented by the emptying of the splanchnic vessels, but the entry of more blood into the abdominal veins is prevented by the rise in intra-abdominal pressure. When the compression is released and the intra-abdominal pressure falls the splanchnic vessels will fill again and tend to reduce the venous return. Blood-pressure tracings show an increase in mean pressure and a slight increase in pulse pressure during compression; the mean pressure falls abruptly by 10–15 mm. Hg when the compression is released and the pulse pressure is diminished.

During rocking when the head-down position is assumed, there is emptying of the abdominal and hind leg veins by gravity. The diaphragm moves towards the thorax and the intra-abdominal pressure is diminished. There is no impediment to the flow of blood into the abdominal veins. Arterial blood-pressure tracings show a gradual rise in the mean pressure and an increase in the pulse pressure. When the animal is placed in the head-up position blood tends to accumulate in the abdominal and leg veins, although this may be opposed to some extent by the increase in abdominal pressure as the diaphragm descends. Judging by the pulse pressure, the increase in cardiac output in the head-down position is much greater than in the compression phase of Schäfer, and the *vis a tergo* continues to maintain the venous return during the head-up phase.

The accumulation of blood in the abdominal vessels is likely to be minimal if the duration of the head-up phase is as short as is compatible with the intake of an adequate volume of air into the lungs. According to the findings presented in Table V this can be less than 2 seconds without reduction in the volume of tidal air. Experimentally, a 6-second respiratory cycle, divided into 4 seconds head-down and 2 seconds head-up, has given good results, although a ratio of 3/2 seems slightly better. If the findings are to be applied to the human subject, a 7-second cycle—4 head-down, 3 head-up—might be most suitable, taking into consideration the dimensions and inertia of the stretcher and subject, although Killick and Eve's (1933) results show that a tidal air of 500 ml. can be obtained at 13 rocks a minute.

Comparison of the effects on cardiac output of pump respiration with those of rocking or Schäfer's method provides no consistent conclusions. In some experiments, as in that yielding the results for Table VI, pump ventilation has been as effective as rocking in maintaining the cardiac output; in others—e.g., Fig. 6—the pump has been relatively ineffective in this respect. The explanation of these discrepancies is likely to be complex. Factors to be considered are the effects of lung inflation and collapse on the pulmonary circulation (Daly, 1930) and the extent and effects of diaphragmatic movement in different animals; but since they do not affect the comparison of the two manual methods they will not, at present, be considered further.

Commentary and Conclusions

It is clear from the results of the experiments which have been described that the oxygen uptake and effective transport during artificial respiration is not governed only by tidal air and ventilation volume. It is therefore impossible to assess the efficiency of different methods of artificial respiration by measurement of tidal air volumes if these differ by only small amounts. It is obvious that more attention should be devoted to an assessment of the circulatory changes which are induced by artificial respiration.

It is concluded that the rate of oxygen uptake and the cardiac output are usually greater with the rocking method than with the Schäfer; the O_2 tension of the venous blood is higher.

The reasons for the differences in oxygen uptake with different methods of artificial respiration are not completely clarified. In any one case it would seem to be necessary to consider the following points: (*a*) Alterations in the tone of muscles due to stretch reflexes which would entail increased oxygen consumption. (*b*) If tissues are anoxic then increased oxygen supply to the part concerned might be followed by an increased uptake. (*c*) The higher rate of oxygen uptake with the rocking method than with Schäfer's method may be due, in part, to the increased cardiac output.

The heart rate in the spinal or deeply anaesthetized animal is constant, and alterations in heart output must be due to changes in stroke volume. In experiments employing the cardiometer, an increase in diastolic volume with rocking has been seen, and this will be associated with an increase in the rate of oxygen usage of the heart (Hemingway and Fee, 1927).

Finally, we are in full agreement with the view (*First Aid in the Royal Navy*, 1943) that the Schäfer method should be immediately instituted when resuscitation is undertaken, and that no time should be lost while preparations are being made for the use of any other method.

We wish to thank Dr. J. McMichael and Dr. A. Schweitzer for valuable suggestions made during the course of this work. A fuller report of the investigation, the expenses of which have been defrayed by the Medical Research Council, is being made to the Naval Personnel Research Committee of the Council.

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THE IMPROVED DENTITION OF 5-YEAR-OLD LONDON SCHOOL-CHILDREN

A COMPARISON BETWEEN 1943 AND 1929

BY

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Historical

It is now established that certain nutritional factors play a prominent part in determining the structure of the dental tissues and their resistance to disease. Interest in this subject was first roused by the investigations on animals and children made by one of us (M. M.) which began in 1917 and have continued up to the present time.

(a) Animal Experiments

It was shown in experiments on puppies and other young animals that perfect and imperfect teeth could be produced at will by small variations in the diet during the period of tooth development (Mellanby, 1918). The chief among these determinants were the fat-soluble vitamins, and especially vitamin D (which in the earlier days was called the calcifying vitamin). This substance acted in association with the calcium and phosphorus of the diet, and for optimum effect required a sufficiency of these elements: in the absence of vitamin D, even large quantities of calcium and phosphorus in the diet did not result in perfectly formed teeth and jaws. A deficiency of this vitamin in the mother's diet during pregnancy and lactation, especially with a low intake of calcium, caused the deciduous or milk teeth, and to a less extent the permanent teeth, of her puppies to be imperfectly calcified, even when, after weaning, their own food contained abundance of these substances; if the puppies continued on the same defective diet as the mother their permanent teeth were very badly formed—more so, in fact, than if the mother's diet during pregnancy and lactation had been good from the point of view of tooth development. It is seen, therefore, that the mother's diet during these periods may to some extent affect the teeth of her offspring for life.

In the living animal, teeth of perfect structure were translucent and felt smooth when their surfaces were rubbed lightly with a probe, whereas varying degrees of roughness were encountered when the teeth were of imperfect structure. It was shown that there was a close correlation between the surface appearance or texture of the teeth, determinable *in situ*, and their minute architecture as seen in microscopical sections made after death.

(b) Investigations on Children

When a large collection of children's shed and extracted teeth was examined and graded according to the standards developed and adopted by M. M. on the basis of the animal experimental work, perfect structure and all grades of imperfection were found, although some 80% came into the latter category. Teeth of good structure were on the whole found to be much less carious than those of defective structure, 78% of the former, compared with 6% of the latter, being caries-free. This relationship, however, did not necessarily apply to the comparatively few teeth with gross enamel defects obvious to the naked eye—forms of dental hypoplasia which used to be, and indeed still are, the only ones generally recognized.

From 1922 onwards a series of investigations on children in a Sheffield tuberculosis hospital (1924, 1926, 1931, and 1934) and in three Birmingham Cottage Homes (1934) were made in co-operation with medical and dental colleagues. These investigations showed that those dietary factors which promoted well-calcified teeth also influenced them after full eruption and tended to retard to some extent the onset and spread of caries. Thus there was in the Birmingham study significantly less incidence and spread of caries in a group of children receiving additional vitamin D and olive oil than in the control group getting extra olive oil without the vitamin: for instance, in the permanent teeth already erupted at the beginning of the investigation an increase of only 8% of carious teeth was found in the vitamin D group in 2½ years, compared with 13.8% in the control group. Moreover, there was an even greater difference in those which erupted during the actual period of the investigation, the structure of which teeth may have been influenced by the diets (i.e., 7.6% of these teeth were carious in the vitamin D group, compared with 17.8% in the control group). In these series of investigations the most important dietary factors for delaying the onset and spread of decay were milk, cod-liver oil, and irradiated ergosterol (vitamin D_2). With low vitamin D and calcium it was found that increasing the cereal content of the diet allowed the disease to spread more rapidly than in the controls with comparatively little cereal, probable reasons for this being that there are some anti-calcifying substances in cereals.

The above facts and many other experimental and clinical results were brought together in three special reports of the Medical Research Council published in 1929, 1930, and 1934 (M. Mellanby).

More recently these investigations on the initiation and spread of caries in children's teeth have been repeated and extended in different parts of the world (Anderson *et al.*, 1934; McBeath, 1932, 1934; McBeath and Zucker, 1938; McBeath and Verlin, 1942; McKeag, 1930; Schiotz, 1937), so that to-day medical and dental clinicians as well as scientific investigators are realizing more and more that nutrition plays an important part in dental disease. They do not always, however, fully appreciate the long period during which dietetic factors must be operative in order to promote good dental structure and increase resistance to disease. For instance, they often expect results after a few months' administration of cod-liver oil, whereas the treatment should begin in early intra-uterine life and continue during the period of growth, and in a modified way probably throughout life.

The *direct* cause or causes of dental caries in human beings, as distinct from the predisposing factors, are not yet known, but in the work referred to above there was enough evidence to demonstrate that a great improvement could be obtained if the dietary of pregnant women, infants, and children were changed to one of higher calcifying quality. The teeth of the new generation would then be of better structure and less prone to decay. It seemed, indeed, that such a step must form the basis of any policy likely to lead to mass improvement of teeth—a point of view which has been constantly urged by one of us for many years. The dietetic changes advised were: (1) an increased consumption of milk, eggs, and other foods comparatively rich in calcifying factors; (2) a decreased intake of cereals, such as bread, oatmeal, and oatmeal preparations; and (3) the addition to the diet of cod-liver oil or some other source of vitamins D and A, especially the former.

(c) National Dietary Changes related to Above Investigations

During recent years interest has become focused on public health in relation to food, and the Government has made a special effort to improve the standard of nutrition of pregnant women, infants, and young children. In the past quarter of a century antenatal clinics and infant welfare centres have been established in increasing numbers to advise on the feeding of both mother and baby. Rickets, so common in the 1920's and earlier, has become comparatively rare in England owing largely, no doubt, to the increased consumption of milk and to the greater therapeutic, as well as the prophylactic, use of cod-liver oil and other substances containing vitamin D. The condition of the teeth of the group of children examined in the present investigation could not have been greatly influenced by school feeding, since the majority did not go to school until they were 5 years old, though a few went to nursery classes or schools; but it is of interest to remember that as long ago as 1906 the London County Council made official arrangements for the supply of school dinners to necessitous children, and in 1910 milk and cod-liver oil could be supplied to children whose home conditions were unsatisfactory or when malnutrition was threatened or present. In addition there were an increasingly large number of other children receiving milk, on payment, as the result of voluntary school milk clubs. Only in 1934, however, when the Milk Marketing Board was set up, was a scheme put into operation to supply milk (at first one-third of a pint and later two-thirds of a pint a day) to children, irrespective of their physical condition, in any part of the

country at the reduced rate of ½d. per one-third pint bottle, or free in necessitous cases.

With the war have come other advances: cheap milk, cod-liver oil, and orange juice, and a priority of eggs, have become available to all pregnant and lactating women, to infants, and to young children. Dinners are provided at most schools, and their quality has been greatly improved; their provision no longer depends on financial or medical necessity, but has been developed as part of the Government's wartime food policy, and many parents take advantage of the scheme. Calcium carbonate has been added to bread (7 oz. to 280 lb. of flour), and the nutritive value of all margarine has been improved by the addition of vitamin D_2 and vitamin A.

(d) Reasons for Present Investigation

While these steps have been taken with the object of bettering the general nutrition of the community and especially of guarding against diseases of childhood such as rickets and concomitant ills, it is obvious that the changes in the dietary are in the main those which the animal and human investigations mentioned above have shown to be necessary for improving the nation's teeth. It seemed of considerable interest, therefore, to see whether there was any evidence that such an improvement had in fact taken place. Fortunately, it was possible to make an inquiry into the question which would provide an answer so far as children attending L.C.C. schools are concerned, for in 1929 a dental examination of some 1,300 unselected 5-year-old children (i.e., children who had not yet come under the full influence of the school dental service) in these schools was made by one of us (M. M.) for the Board of Education. The surface structure of the enamel and the presence and extent of caries in each tooth were recorded; later some of the findings, together with other records made on the same children, were published by the Board of Education (1931). By using the same criteria and examining the same age group attending these schools to-day it would therefore be possible to see what, if any, improvement had taken place in the intervening 14 or 15 years.

Dr. W. Allen Daley, the School Medical Officer to the London County Council, was approached, and the Council's permission to carry out an investigation was readily given.

The Present Investigation

When any school visited in 1929 was closed or was no longer used as an infants' department, one or more other schools in the same neighbourhood, as near as possible to that previously inspected, were taken as substitutes. In addition, a few schools in other districts were visited, but they are not included in the main tables.

In 1929 the schools were divided, with the help of the local Care Committees, according to their level in the social scale. For the purpose of the present investigation, therefore, the Care Committees were again approached, and after consultation they made a rough classification into four grades; but they could not guarantee that their groupings were comparable with those made in 1929, which were indicated by the signs B+, B, B−, and C. Moreover, there is now a greater mixing in the schools than hitherto of children from families of different social and financial levels. This is due to many causes, including the clearance of slums and the building of large blocks of flats, the transference of families from one area to another owing to destruction of homes from enemy action, evacuation schemes, etc. Then, again, the financial status of many families has been altered, either raised or lowered, as a result of the war.

In the present survey the dental examinations were shared by us, the majority of children being inspected by H. C. From time to time during the course of the survey, and especially at the beginning, the teeth of many children were examined separately by both investigators, the two records being compared so that as far as possible the same standard would be kept; this was especially necessary for the grading of structure, in which the personal factor plays a prominent part. We were in agreement in most cases; where differences did occur they were generally small.

Detailed examinations of all teeth were made for signs of M-hypoplasia (see next paragraph), gross hypoplasia (the generally recognized varieties), and caries. Other conditions of the teeth, including their alignment, the presence of mottled enamel, and the state of the gums, were noted, but are not considered in this paper. Since results of the 1929 investigation were given as percentages of children showing varying degrees of hypoplasia and caries, similar figures will be given here. A more detailed analysis of our findings will be published later.

(a) The Structure of the Teeth

The standards used for structure were similar to those adopted in the 1929 Board of Education survey, which were evolved from the results of the investigations referred to above. Individual teeth were taken to be of normal or perfect structure when their surfaces were smooth and shiny, like those of the teeth of puppies given a mixed diet relatively rich in vitamin D and containing the necessary calcium and phosphorus. Teeth showing imperfections of surface structure were classified into three grades: slightly defective, defective, and very defective. These types of defects will be referred to as M-hypoplasia, a term first used by J. D. King in 1940 to distinguish them from the previously recognized gross or G-types, which are rarely seen in deciduous teeth. The M-type defects were originally described by M. Mellanby (1923, 1927, 1934), who found that some 80% of 1,500 deciduous teeth were so affected.

The surfaces of the teeth with M-hypoplasia show varying degrees of roughness which are not always visible to the naked eye when the teeth are *in situ*, but can easily be detected when their surfaces are lightly rubbed with a probe; the degree of roughness as indicated by the "feel" of the probe can be judged with practice. A sufficiently reliable clinical assessment of the enamel surface texture is obtained if the test is confined to the buccal aspect of the teeth. When each tooth had been considered separately a general computation was made for the structure of all the teeth of a given child, keeping so far as possible to the method of assessment used in the 1929 investigation but dividing the children into only four groups instead of seven: Good structure, Little M-hypoplasia (1 and 2), Some M-hypoplasia (3 and 4), and Much M-hypoplasia (5 and 6). The figures in parentheses refer to the 1929 grouping. The few cases of gross hypoplasia were included in Group 4.

Although 1,604 children were examined in the main survey and included in the caries incidence tables, 33 of them had lost too many teeth for it to be possible to classify for structure, reducing the number for this purpose to 1,571.

In Table I the structure of the teeth in the two investigations is set out. It is clear that in the 14 years that have elapsed the

TABLE I.—*Incidence of M-hypoplasia in Deciduous Teeth*

	Total Number of Children	Percentages of Children Showing:			
		None	Little	Some	Much
1943	**1,571**	**1·2**	**18·1**	**47·4**	**33·3**
1929	1,139	0	7·8	33·6	58·5

picture of deciduous tooth structure has changed for the better. Even so, there are very few children with a full complement of perfectly calcified teeth; however, in 1943 18.1% had only slight M-hypoplasia, compared with 7.8% in 1929, and there were fewer with much M-hypoplasia—33.3% as against 58.5% respectively.

In Table II the findings are given when the schools are divided according to their estimated social status. There are no great

TABLE II.—*Incidence of M-hypoplasia in Deciduous Teeth at the Different Social Levels*

Social Grading of School	Total No. of Children	Percentages of Children Showing:			
		None	Little	Some	Much
Highest grade (B +)					
1943	**190**	**0·5**	**25·8**	**49·0**	**24·7**
1929	133	0	12·8	30·8	56·4
2nd grade (B)					
1943	**582**	**1·0**	**14·8**	**50·2**	**34·0**
1929	423	0	9·9	36·4	53·7
3rd grade (B −)					
1943	**556**	**1·8**	**18·0**	**45·1**	**35·1**
1929	190	0	4·7	30·0	65·3
4th grade (C)					
1943	**243**	**0·8**	**20·2**	**44·9**	**34·2**
1929	393	0	5·4	33·3	61·3

differences in these groups in 1943, although the tendency is for the highest-grade schools (B+) to have teeth of rather better structure than the schools in the other three grades, which differ little on the whole. In 1929 there was a suggestion that the quality of structure was worse in the lower-grade schools.

(b) Incidence of Dental Caries

For the grading of caries each tooth was examined by probe and mirror and put into one of four categories, as follows:

No caries that could be diagnosed as definite caries by our methods of examination. (No radiographs were taken.)

Slight caries: Very early and suspected fissure and approximal caries.

Moderate caries: Cavities involving destruction up to roughly one-quarter of the tooth crown.

Advanced caries: Destruction of more than one-quarter of the tooth crown.

Fillings and arrested caries were classified very roughly according to the extent of the crown involved and included as carious. If deciduous molars or canines had been lost it was assumed that they had been extracted for advanced caries, since they should normally be present at the age under review.

When each tooth had been graded separately the children were divided into four groups according to the total amount of caries present; the method of assessment used was as nearly similar to that of 1929 as possible: No caries,* Little (1 and 2), Some (3 and 4), and Much caries (5 and 6). The figures in parentheses relate to the 1929 classification, when seven groups were distinguished instead of four.

Table III gives a comparison of the relative amount of caries for the two investigations: 22.4% of the children in 1943 were "caries-free," compared with 4.7% in 1929; and only 29.3% had much

TABLE III.—*Incidence of Dental Caries in Deciduous Teeth*

	Total Number of Children	Percentages of Children Showing:			
		No Caries	Little Caries	Some Caries	Much* Caries
1943	**1,604**	**22·4**	**25·9**	**22·4**	**29·3**
1929	1,293	4·7	11·7	20·8	62·8

* Only 6% of the children in this category in 1943 would correspond with the C6 group (very bad caries), compared with 54% in 1929.

caries, as against 62.8% previously. Actually the improvement is even greater than these figures suggest, because in 1943 only about 6% of those in the "Much" caries group could be classed in the C6 category (very bad caries), compared with 54% in the earlier investigation, which included a number of edentulous children. No edentulous child was seen in 1943. In both investigations the amount of caries varied considerably from one school to another; in 1943 the percentages of caries-free children ranged from 5 to 37 and of "Much" caries from 50 to 11.5. In 1929 the comparable figures were 0 to 15.4% and 79 to 39% respectively.

Table IV indicates that in 1943 there was distinctly less caries in the B+ schools than in the other three grades, which differed little

TABLE IV.—*Incidence of Dental Caries in Deciduous Teeth at the Different Social Levels*

Social Grading of School	Total No. of Children	Percentages of Children Showing:			
		No Caries	Little Caries	Some Caries	Much Caries
Highest grade (B +)					
1943	**193**	**29·5**	**28·5**	**21·2**	**20·7**
1929	147	6·1	17·7	15·6	60·6
2nd grade (B)					
1943	**596**	**20·8**	**27·7**	**22·0**	**29·5**
1929	480	6·5	11·3	22·6	59·6
3rd grade (B −)					
1943	**569**	**22·9**	**23·6**	**21·1**	**32·5**
1929	210	3·8	10·5	22·9	62·8
4th grade (C)					
1943	**246**	**19·5**	**25·2**	**27·2**	**28·1**
1929	456	2·8	10·5	19·5	67·1

among themselves. In 1929 there was a slight tendency for the amount of caries present to increase from the better to the poorer schools.

(c) *Subsidiary Survey*

As already mentioned, a subsidiary survey was made of several schools in districts not visited in 1929. The findings are therefore given separately. The amount of hypoplasia was about the same as that found in the schools in the main survey, but there was less decay: 35% of the children had no definite caries.

TABLE V.—*Incidence of M-hypoplasia in the Subsidiary Survey*

Social Grading of School	Total No. of Children	Percentages of Children Showing:			
		None	Little	Some	Much
Highest grade (B +)	134	0·8	12·7	61·9	24·6
3rd grade (B −) ..	128	0	14·8	46·1	39·1
Total	262	0·4	13·7	54·2	31·7

The schools all came into the B+ and B− categories. In the former, 135 children were seen, of whom 40.7% had no definite caries and only 11.1% had "Much" caries. The teeth of the 131 children

* There are children included in this group in whom *very* early caries was present in two or three teeth, and whom to-day we should probably prefer to include in a separate group between caries-free and little caries; but the standard here used is that adopted in 1929, when so few children were seen with anything approaching a caries-free mouth.

TABLE VI.—*Incidence of Dental Caries in the Subsidiary Survey*

Social Grading of School	Total No. of Children	Percentages of Children Showing:			
		No Caries	Little Caries	Some Caries	Much Caries
Highest grade (B +)	135	40·7	25·2	23·0	11·1
3rd grade (B −) ..	131	29·0	19·1	25·2	26·7
Total	266	35·0	22·2	24·1	18·8

in the B− schools were not as good from this point of view as those in the B+ schools, but nevertheless 29% of the children were "caries-free" and 26.7% had "Much" caries. The percentages of "caries-free" children in the individual schools ranged from 27 to 44 and those with "Much" caries from 38 to 8.

(d) *Arrest of Caries*

In the Sheffield investigation carried out by one of us (M. M.) in co-operation with Dr. Lee Pattison, and referred to above, a striking feature noted in groups of children having a good calcifying diet was the relatively high proportion of decayed teeth in which the caries was no longer active—in other words, in which the caries had become arrested. Many of these children were examined at regular intervals over long periods, and it was found possible to trace the gradual arresting of the carious process. It is therefore significant that in the present survey typical arrest was found in at least some teeth of 28% of all the children with caries.

(e) *Association of M-hypoplasia and Caries*

A close association exists between the quality of a tooth and its resistance to decay, as has been mentioned above. To assess this relationship accurately it is necessary to consider individual teeth, but it was thought that a rough indication might be obtained by correlating the structure of the teeth and the amount of caries per child, taking for this purpose only those cases in which no canines or molars were missing. None of the few children with perfect and under 5% of those with nearly perfect dentition were placed in the two worst categories of caries, whereas 38% of the children with "Much" hypoplasia had also "Much" caries and only 8% were "caries-free." It is interesting to note that 34% of those with "Some" hypoplasia had no caries and 40% had "Little"; this suggests that some post-eruptive influence (direct or indirect) was at work, though it must be borne in mind that these children were under 6 years of age and the molars still had a long period in the mouth in which they might become carious.

Discussion

The data obtained in this survey show clearly that there has been a distinct improvement since 1929 in the dental condition of 5-year-old children attending London County Council elementary schools. The quality of the teeth is now better; in 1943, 19% of the children had teeth of good structure, compared with 8% in 1929, while the percentages with very defectively formed teeth (i.e., teeth with "Much" M-hypoplasia) were 33 and 58 respectively. The reduction in the incidence of dental decay is even more striking: in 1943, 22% of the children were "caries-free," compared with 5% in 1929, while only 29% had "Much" caries in 1943, as compared with 63% in 1929. When the schools were grouped according to social status there was little difference in dental condition as regards both structure and caries between the various grades, though the teeth tended to be rather better in the highest-grade schools in 1943 and in the two highest grades in 1929.

These observations, however, do not show whether the improvement is of recent occurrence or whether it has been gradual in this social stratum of London during the past 14 or 15 years. Since, however, the teeth of the 1943 5-year-old children were in the main formed in the immediate pre-war years and the first year of the war, the cause of the improvement in these particular children must be sought among factors operative at and since that time and contrasted with the conditions in the years 1922–9, when the teeth of the children examined in the previous survey were developing. Can the improvement be attributed to the changed dietary referred to earlier, which has increased the intake of vitamin D and calcium by the provision of cheap milk and of cod-liver oil to infants and young children, together with the addition of vitamins D and A to the margarine and of calcium carbonate to the bread: or is it due to other unknown influences which have been brought to bear on child life in London during these years? No categorical answer can be given to this question, because there still remains much to be discovered not only about the relation of nutrition to dental conditions but also about the

immediate cause of caries. All we can do in attempting to answer the question is to argue from established knowledge and see to what extent this explains the observations.

It is known that the structure of the deciduous and permanent teeth of young animals is affected by the diet during their period of tooth development, both *in utero*, during lactation, and especially after weaning, when much greater defects in dental structure of the offspring may result from diets poor in calcifying properties. The mother has a large quantity of calcium in her bones and sometimes stores of vitamin D in her body; these substances she undoubtedly sacrifices to some extent to her offspring when she herself is deficiently fed, but these offspring will have little or no stores of vitamin D after weaning, so that a poor calcifying diet taken at this time very soon exerts its baneful influence. The same principle probably applies in the case of the child, and it is therefore very important that the pregnant and lactating woman, and later the infant itself, should have diets rich in the factors necessary for the production of well-calcified teeth.

The experimental evidence that *dental structure* is largely controlled by the ingestion of enough vitamin D, calcium, and phosphorus is so strong that it is difficult to avoid the conclusion that the improvement in dentition of the 1943 children has resulted largely from the changes in dietary in the immediate pre-war and early war period. If this is the case, and if mothers and children are taking and continue to take full advantage of the additional improvements in dietary that have been placed at their disposal during the last year or two, it seems safe to predict that children's teeth now being formed will be even better than those of the children seen in the 1943 survey.

While, therefore, the reason for the improvement in dental structure seems clear, the cause of the reduction in *dental caries* is less certain. Since M. M.'s early investigations on children's teeth showed that those of good structure were less liable to caries than those of poor structure, and since the structure of the teeth in this survey was better than in 1929, some reduction in the amount of caries was to be expected from this cause alone. The reduction observed, however, was greater than could be explained on this basis, so that some other contributory factors were evidently at work.

Investigations carried out by M. M. and her colleagues and others have shown that the dietary factors which promote well-calcified teeth also tend to retard the onset and spread of caries, apart from their influence on structure. The dietary of the young children in the 1943 survey has been improved from this point of view even beyond the standard reached during the immediate pre-war period and early part of the war, when their teeth were being formed, and it is considerably better than the dietary at the corresponding period in the lives of the 1929 group of children. It might be surmised, therefore, that the reduction in caries in 1943 as compared with 1929 is due in part to the better structure, which is related to better calcifying dietary, in part to the post-eruptive influence of the even better dietary condition of the war years, and possibly in part to other unknown changes. What these other factors are that may share the responsibility for the diminution of caries in these children can only be conjectured. Some would say that changes in the carbohydrate intake or the fluorine intake or of food consistency, or a greater use of the toothbrush have played a part. Unfortunately the basis of these suggested factors is too insecure at the present time to allow their effects to be assessed adequately.

If the present national food policy has been responsible, as seems likely, for much of the improvement of the teeth here reported, this only emphasizes the importance of still greater efforts on the part of central and local government in the same direction, for even to-day 78% of these 5-year-old children have some decayed teeth. Parents must be taught to realize that the consumption of milk and vitamin D is a *sine qua non* for improvement of the teeth of their children, and they must be induced to co-operate more willingly in this health-giving project. Much has already been done by the staffs of welfare centres, school medical and dental officers, Care Committee workers, and teachers; but unfortunately there still remains a fair proportion of parents who, for one reason or another, fail to take full advantage of the dietary supplements at their disposal.

The facts emerging from this investigation can be regarded as heartening and as providing evidence that we are at last taking steps in the right direction to attack successfully the most widespread of the ills of civilized man. Florid rickets—the cruder manifestation of defective calcification—has been virtually eliminated in England by better feeding of pregnant and lactating women, and of infants and children. It is possible that the elimination of dental caries may not be attainable until its immediate cause is known, but even without this knowledge it is probable that a continuation and extension of the present nutritional policy and its more whole-hearted adoption by the public would bring about further improvement in the architecture of teeth and in their subsequent resistance to decay. It would then at least be possible to present to dental surgeons a situation which they could tackle hopefully.

Summary

The results are given of two large-scale dental surveys of 5-year-old children in the same or comparable schools of the London County Council in 1943 and 1929.

During the intervening period a great improvement has taken place both in the structure of the deciduous teeth and in their resistance to decay. (*a*) 19% of the children had teeth of perfect or nearly perfect *structure* in 1943, compared with 8% in 1929, and only 33% had very defectively formed teeth (i.e., teeth with much M-hypoplasia), compared with 58% in 1929. (*b*) In 1943 22% of the children were, according to the standards used, "*caries-free*," compared with about 5% in 1929.

That there is still great room for improvement in dental condition is demonstrated by the fact that even at the present time between 56 and 95% of children in individual schools visited in the two surveys had dental decay in at least some of their teeth.

It is thought that the observed improvement in the dental condition of this age group may be largely due to the changes in feeding habits which have been developing in recent years—in particular to the introduction in 1934 of the cheap milk scheme of the Milk Marketing Board and later to the wartime food policy, which included (*a*) increased allowances of milk together with cod-liver oil and fruit juices to pregnant and lactating women, to infants, and to young children; (*b*) the addition of vitamins A and D_2 to margarine; and (*c*) the addition of calcium carbonate to bread. These are dietetic changes that investigations on animals and children carried out by one of us (M. M.) since 1917 have established as essential for the improved dental condition of the general child population.

Our thanks are due to many people who have helped us directly or indirectly with this investigation. These include: the London County Council and Dr. W. Allen Daley for their permission to carry out the inspections, for making the necessary arrangements at the schools, and for their kind interest in the progress of the survey; the Care Committee Organizers for grading the schools and for other valuable assistance; and Miss Irene Allen for general help, and especially for working out the results given in the tables. Last, but by no means least, we want to thank the head teachers of the infant schools and their assistants, without whose willing and interested co-operation the work would have been impossible. H. C. holds a scholarship from the British Council, and other expenses were paid by the Medical Research Council; to both of these bodies we are very grateful.

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In an address to the Conference of the Children's Nutrition Council (Wales) at Cardiff on May 13, Mr. Eddie Williams reminded his audience that the object of the Council was "to ensure that no child, by reason of the poverty of its parents, shall be deprived of at least a minimum of food and other requirements necessary for full health." He strongly advocated the institution of school meals throughout Great Britain.

POLIOMYELITIS IN BRITISH AND AMERICAN TROOPS IN THE MIDDLE EAST

THE ISOLATION OF VIRUS FROM HUMAN FAECES

BY

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Van Rooyen and Morgan in 1943 called attention to poliomyelitis as a *military disease* in the Middle East. Since 1940, cases of this disease among British troops have not been uncommon; many have been severe, and a high percentage have been fatal. From several of these fatal cases (occurring in 1942 and 1943) the virus of poliomyelitis has been isolated by them from the central nervous system, and the properties of some of these strains have also been studied by Schlesinger *et al.* (1943) in the United States. The present report is concerned with a series of attempts to isolate poliomyelitis virus from the *stools* of typical (and borderline) cases of poliomyelitis, which occurred during 1943 among British and American troops stationed in the Middle East—particularly in Libya, Egypt, and Palestine. The tests have been undertaken to determine: (i) their local value as a confirmatory diagnostic procedure; and (ii) whether these adult cases (which have occurred for the most part sporadically) harbour the virus in the intestinal tract in the same manner as do juvenile cases in areas where the disease is more apt to be epidemic.

Prevalence of Poliomyelitis in the Middle East

From the onset of this work we have been concerned with the circumstances under which this peculiarly severe type of poliomyelitis has occurred in civilian as well as military populations of the Middle East during recent years. In *Egypt* there is a dearth of published information on this point. Reports to the Egyptian Ministry of Health appear inadequate, for only a few cases—nearly all of them fatal—have been listed during recent years. Thus in the year 1938 the Egyptian Ministry of Health reported, for all of Egypt (16 million people), only 3 cases of poliomyelitis, with 2 deaths; and in 1939, 8 cases and 8 deaths. To supplement this information we have obtained data from two prominent Cairo paediatricians,† who agree that poliomyelitis is "not uncommon" in Egypt—a fact which becomes evident from a glance at Table I, which gives the number of new cases seen annually at the Children's Hospital Dispensary of Cairo.

TABLE I.—*Incidence of Poliomyelitis at the Children's Hospital Dispensary, Cairo**

Year	New Cases	Total New Patients Admitted to Dispensary	Approx. Rate per 1,000 Admissions
1933	71	58,000	1·2
1934	74	73,000	1·0
1935	24	77,000	0·3
1936	48	100,000	0·5
1937	22	110,000	0·2
1938	96	116,000	0·8
1939	41	122,000	0·3
1940	149	148,000	1·0
1941	110	160,000	0·7
1942	201	165,000	1·2

* Data kindly furnished by Prof. Shawki.

* From the Neurotropic Virus Disease Commission (Board for the Investigation of Influenza and Other Epidemic Diseases in the Army, Preventive Medicine Service, Office of the Surgeon General, U.S. Army).

† We are indebted for this information to Dr. Ibrahim Shawki Bey, Professor of Paediatrics, Faculty of Medicine, Cairo: and Dr. Edouard Debbas, Physician-in-Chief for Diseases of Children at the Israelite Hospital in Cairo.

Data in this table indicate a fairly high endemic rate for poliomyelitis in the civilian population of Cairo; probably it is greater than hitherto suspected. There have been fluctuations from year to year, but the disease has not appeared in epidemics during this period. Furthermore, in contradistinction to the experience in temperate climates, it is more of an all-year-round disease in Egypt, with maximal incidence in March, April, and May, and again in October.

Information about the civilian age groups involved is scanty, but most of the cases listed in Table I have been in patients under 5 years of age. Poliomyelitis in the native Egyptian *adult* seems to be rare, and from verbal accounts no cases have been seen recently at the Military General Hospital in Cairo. The local juvenile cases have usually been mild and severe bulbar cases rare. Prof. Shawki has seen only 2 cases of severe acutely ascending paralysis in local children.

In *Palestine* some information has been published by Levy (1937), who concluded that there, also, poliomyelitis was not uncommon, in that for the 20-year period 1915–34 he was able to collect from the records of orthopaedic dispensaries and physicians a series of 215 paralytic cases. From these data he estimated the average incidence of poliomyelitis to be only slightly lower than that of the United States! On the other hand, it was not common among the large native Arab population, the highest prevalence being among Jews (12.3 per 100,000)—an average rate 25 times that noted among Moslems. Seasonally, as in Egypt, there were two periods of increased incidence—one in May and June and another in October and November. And, again as in Egypt, the disease was largely one of infants—85% of the cases being recorded in children under 4 years of age. Adult cases were not mentioned.

This is the present setting in the Middle East, where many cases have occurred among British troops. To quote from van Rooyen and Morgan's report: In 1941 a total of 74 cases were notified as acute poliomyelitis or encephalitis in the M.E.F., and of these 19 were fatal; in 1942 there were 32 cases, with 14 deaths. The rate among American soldiers stationed in the Middle East (during the first 10 months of 1943) has been more than 10 times that recorded in the United States (see Table II) for a similar period of time.

TABLE II.—*Poliomyelitis Rates per 1,000 in the U.S. Army*

Year	In the Middle East	In the United States
1940	—	0·02
1941	—	0·02
1942	?	0·03
1943	0·425*	0·03†

* To Oct. 1, 1943. † To Sept. 12, 1943.

Clinical Epidemiology

Contacts and living quarters were investigated in 10 military cases of poliomyelitis or polio-encephalitis, which were probably acquired in Cairo between May 1 and Oct. 15, 1943. The cases were ubiquitous as to their place of origin. No two patients seemed to have been in contact. No civilian cases were discovered among adults or children living in close proximity to the patients' quarters. This does not mean that epidemics of poliomyelitis do not occur in the Middle East. Caughey has described, in an unpublished report, an epidemic of poliomyelitis which occurred in 1941 among New Zealand troops stationed in Egypt. Subsequently there have been other small localized outbreaks. During the summer of 1943 there were two of these—in Libya and in Tripoli. We did not have the opportunity of examining these situations first-hand.

Isolation of Virus from Stools

During the past five or six years methods of testing stools of poliomyelitis patients for virus have been revived by Trask *et al.* (1938) for purposes of diagnosis and epidemiological study. Recent published reports, of which there are many in American medical literature, now record positive isolation experiments in well over 100 cases. Advantages of testing stools rather than nasopharyngeal washings in this disease rest on the fact that in the average juvenile case the virus remains in the intestinal tract (during convalescence) for much longer periods (roughly 20 days) than it does in the nasopharynx

(roughly 2 to 4 days). Most of the recent work by Trask *et al.* (1938 and 1940), Kramer *et al.* (1939), Howe and Bodian (1940), Kessel *et al.* (1941), and Sabin and Ward (1941a) in the United States; by Kling *et al.* (1939) in Sweden; and by Lépine *et al.* (1939) in France has been done on children, and it has been found to be easier to isolate virus from stools of young children (under 8 years old) than in children over this age. Information with regard to the presence of virus in the stools of adult poliomyelitis patients is far more limited.

Necropsy studies by Sabin and Ward (1941b) and by Kessel *et al.* (1941) in their series of fatal cases (most of which were in the second week of the disease) have also pointed to the intestinal tract as a site of predilection for the virus. They found that in this stage of the disease the virus was distributed predominantly in two systems: (*a*) certain regions of the nervous system; and (*b*) the walls of the pharynx and ileum, and the intestinal contents. These may not be the only locations at all times during the disease, but they are the most prominent after serious lesions have become established.

The *epidemiological* significance of the presence of poliomyelitis virus in the stools of human cases remains unsolved, for as yet the portal or routes of entry of the virus are unknown. Modern research has indicated that the nasal mucosa and olfactory bulbs can no longer be regarded as the main avenues of infection, because human necropsies have failed to reveal in these bulbs characteristic lesions which were shown to be present by Sabin and Olitsky (1937) when the disease is induced experimentally in the monkey by instillation of virus into the nostrils. Indeed, if analogy existed between the human and the experimental disease, then it would seem that infection through the pharyngeal or gastro-intestinal tract should be seriously considered, because of the relative ease with which chimpanzees and cynomolgous monkeys may be infected by feeding them with virus.

Of further and possible epidemiological significance is the fact that the virus has been isolated from samples of sewage collected by Paul *et al.* (1940) in the United States, and by Kling (1940) in Sweden, during epidemics. Of more interest is the recent discovery of its presence in flies collected at different epidemic centres. This has been noted by Paul *et al.* (1941), by Sabin and Ward (1941c), and by Toomey *et al.* (1941). Unfortunately, these findings do not indicate how the disease is disseminated, but they reopen the question whether poliomyelitis may not be legitimately placed among the excremental infective diseases pending such times as it may be proved otherwise. In fact, the evidence for other means of infection is appreciable, for poliomyelitis can be reproduced by injecting infective material *subcutaneously* in monkeys, as has also been the case in accidental human infections (Leake, 1935). Consequently, in view of this latter feature, one cannot ignore the possibility of the disease being transmitted by a biting insect. The need for intensive study on the widest possible scale is thus apparent.

Clinical Material

Stool specimens from 35 patients (and contacts) were tested; 17 of these were American and 18 British.* Four different clinical types of case were chosen for study:

(I) Fifteen typical cases of *poliomyelitis* were tested in all, of which 10 were fatal.

(II) Five cases diagnosed *polio-encephalitis*, with a short (3- to 4-day) febrile course and paralyses *limited to the cranial nerves*. In general the *epidemiological* background and circumstances in which these cases were contracted were suggestive of poliomyelitis. Positive spinal-fluid findings consisted of pleocytosis varying from 30 to 60 cells (about 60% lymphocytes) and slightly increased protein content.

(III) Six cases were diagnosed *acute benign lymphocytic meningitis*. Paralysis was not noted except in an occasional case in which there was a transient sixth-nerve lesion. The cell count in the spinal fluid ranged between 20 and 80 cells. In none of these patients did the fever last more than 4 days, and so for this and other reasons we have considered the diagnosis of lymphocytic choriomeningitis to be improbable.†

(IV) Six cases in which localized *neuritis*, usually involving one or more limbs (generally the upper arms), has often followed a brief period of diarrhoea or fever, or both. A description of the syndrome as seen in New Zealand troops has recently been given by Burnard and Fox (1942). The spinal-fluid findings in our series have usually been normal.

(V) Three poliomyelitis contacts.

Laboratory Methods

Stool specimens were as a rule kept refrigerated (or preferably in the frozen state at −60 to −70° C. in a refrigeration box containing solid CO_2) until ready to be tested. In most instances this period of preserving the sample before its inoculation did not exceed two weeks. Occasionally, when stool specimens were not readily obtainable, enema washings were substituted. In 7 instances colon contents were obtained at necropsy. The usual clinical course of these fatal cases was rapid, and by the second or third day constipation and profound prostration were such that in a large number of instances specimens of faeces could be obtained only at necropsy. In these circumstances a loop of colon was tied off with string, and the loop was excised and placed in the ice-box (for 24 to 36 hours) until the contents could be removed under sterile conditions.

In preparing faecal material for monkey inoculation the following procedure was used:

A 10% suspension in sterile distilled water (using at least 5 or 6 g. of solid or semi-solid stool) was prepared and allowed to settle at room temperature; the supernatant fluid, amounting to about 50 c.cm., was then divided in half (parts A and B). Part A was kept at ice-box temperature and instilled into the nostrils (in 3-c.cm. amounts) of a single monkey on three or four successive days; part B was immediately centrifuged for 20 minutes at about 2,000 r.p.m., and to the supernate 15% ether was added as a bactericidal agent. The etherized suspension was kept refrigerated for 48 or 72 hours and inoculated intra-abdominally in amounts of 15 to 20 c.cm. into the same monkey. This concentration of ether was usually sufficient to destroy or diminish the number of bacteria in the suspension to proportions small enough to permit intra-abdominal injection of 15 or 20 c.cm. of stool extract without fear of inducing peritonitis.

Daily rectal temperatures and exercise records were taken for a period of four weeks on all monkeys inoculated in this manner. A positive result was based on the following criteria in the inoculated animal:

1. "*Clinical.*"—Signs of the experimental disease—viz., fever, tremor, weakness, paralysis, and prostration, all or some of which may be present in varying degrees.

2. *Pathological.*—The presence of characteristic histopathological lesions in the medulla and various levels (cervical, dorsal, and lumbar) of the spinal cord.

With the exception of the experiments by van Rooyen and Morgan, who isolated poliomyelitis virus from the human spinal cord in grivet monkeys and baboons, the types of monkey used in these tests on faecal material have to our knowledge seldom before been employed in poliomyelitis work. Five different species were used: (i) grivet monkeys, *Cercopithecus griseoviridis*; (ii) Central African vervet monkeys, *Cercopithecus aethiops centralis*; (iii) small immature Abyssinian baboons, *Papio hamadryas*; (iv) Hussar monkeys, *Erythrocebus patas*; (v) the bonnet monkey, *Macacus radiata*.

Four of these species (Nos. i–iv), all from East Africa, were shown in these experiments to be susceptible to infection with poliomyelitis virus. Of these we have reason to believe that the baboons are the least susceptible by the various routes of inoculation used. The fifth variety, or bonnet monkey (from India), of which we had only three specimens, was not adequately tested. In the whole series of experiments (including passage experiments) 44 monkeys were used, 6 of the animals twice.

Results

A summary of the tests performed appears in Table III. In most instances the results have been listed according to the day of disease on which the stool was collected.

Poliomyelitis Cases.—Of the 15 cases tested, the stools (or colon contents) in 9 were positive for poliomyelitis virus.

* We are indebted in particular to Major C. R. Amies, R.A.M.C., for many of these specimens. Other members of the R.A.M.C. to whom we are indebted for the collection of specimens include Major H. K. Fidler, Lieut.-Col. J. H. Fisher, Major J. E. Caughey, and Major R. S. Illingworth.

† Likewise, in precisely similar cases, efforts to demonstrate specific neutralizing antibodies in the blood have all been unsuccessful.

All of these positive cases proved to be fatal. In one of them the stool was obtained before the patient's death. In one of the 15 cases the result was unsatisfactory owing to the premature death of the monkey. These results suggest that

TABLE III.—*Results of Stool Tests for Poliomyelitis Virus*

Type of Case	Total Patients	Day of Disease Stool Collected	No. of Patients	No. Positive for Polio. Virus	No. Neg.	Unsatisfactory Tests*
Poliomyelitis ..	15	3–10	9	8 } 9	1 } 5	0
		11–18	6	1	4	1
Polio-encephalitis ..	5	9–79	5	0	5	0
Poliomyelitis contacts	3		3	0	2	1
"Benign lymphocytic meningitis"	6	4–6	5	0	4	0
		7–21	1	0	1	0
Neuritis	6	6–8	4	0	4	0
		9–14	2	0	2	0

* The experiment was considered unsatisfactory if the monkey died (without developing poliomyelitis) before the termination of the 4-week (post-inoculation) period of observation.

the amount of virus present in the intestinal tract was greater in the more severe than in the milder cases of poliomyelitis in this series—a finding which has not to our knowledge received comment before, and one which may not hold true for juvenile cases. Another point, however, in the interpretation of the high percentage of positive results from the fatal cases (which for the most part were fulminating in type) is that most of the "stools" were collected *earlier* in the disease (on the third to tenth day) than in the other poliomyelitis cases. It has long been recognized that the chances of obtaining positive results are greater during the first than during the later weeks of the disease.

Other Cases (Groups II, III, and IV).—All tests for virus in the stools from cases other than typical poliomyelitis proved negative. Several of the monkeys developed fever without symptoms of myelitis and were killed. Histological examination of the spinal cord proved negative, and no doubtful positive results were obtained; but, needless to say, failure to find poliomyelitis virus in such cases does not necessarily exclude the disease.

Summary

The stool test as a confirmatory means of diagnosis in clinical poliomyelitis has been used in 15 cases of typical poliomyelitis, 17 atypical cases, and 3 contacts, which occurred in British and American troops stationed in the Middle East during 1943.

From the 10 *fatal* cases of poliomyelitis the isolation of virus from stools was accomplished in 9 instances.

Negative findings have been encountered in the remaining 5 (non-fatal) cases of poliomyelitis (one test was unsatisfactory), and negative results were likewise encountered in 20 "atypical" cases (and contacts)—viz., 5 cases of polio-encephalitis, 6 cases of "acute benign lymphocytic meningitis," 6 cases of neuritis, and 3 poliomyelitis contacts. The negative virus findings do not wholly exclude the possibility of poliomyelitis.

Grivet and vervet monkeys, obtainable in East Africa, are highly susceptible to experimental infection with poliomyelitis virus.

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SYMPATHECTOMY AND STERILITY

BY

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A patient upon whom I performed a lumbar sympathectomy some years ago was recently on trial on a charge of "incest." His defence was that as the operation had rendered him sterile it was impossible that he could be the father of his daughter's child. This information he had culled from a surgeon whom he had consulted subsequent to the operation, but before the alleged crime was committed. As removal of part of the lumbar sympathetic chain is now performed with considerable frequency, and in view of possible legal implications, it is time that the question of any resultant sterility should, if our knowledge warrants it, be unequivocally settled.

The physiologists have a good deal to teach us regarding the mechanism of ejaculation and its dependence upon the autonomic supply to the base of the bladder. The course taken by the sympathetic supply is apparently a long one down through the so-called "lumbar splanchnics" and the pre-aortic plexus, coming particularly from the first lumbar contribution. As this part of the lumbar chain is not usually removed in the ordinary operation, the sympathetic fibres concerned with ejaculation should escape. But whatever the physiological and anatomical considerations, the practical outcome is whether in fact patients who have submitted to the operation can procreate and whether their semen is normal.

It has proved more difficult than would be expected to get definite evidence to answer the first question. For reasons unconnected with physical sterility these patients appear very rarely to become parents after the operation. However, I know of two cases in which a child was born subsequent to the operation. The second question is more readily answered. I have examined several specimens of semen obtained from such patients which to my inexperienced eye appeared normal, but a more complete examination of some of the specimens has been carried out by Dr. D. Embleton, to whom I should like to express my thanks. Sample results are as follows:

Examination of Semen after Sympathectomy

Case 1.—Aged 42; proximal type of thrombo-angiitis obliterans; one year after operation. Volume of seminal fluid, 1.5 c.cm.; *p*H, 8.0; colour, greyish white; number of spermatozoa, 212 millions per c.cm.; differential count, normal forms 54%, abnormal 46%; hanging drop, about 50% motile.

Case 2.—Aged 50; distal type of thrombo-angiitis obliterans; ten years after operation. Volume of seminal fluid, 1.5 c.cm.; colour, greyish white; number of spermatozoa, 162 millions per c.cm.; hanging drop, 83% motile.

This should be sufficient to convince the most sceptical jury in a criminal case.

Comment

The thoroughness of the sympathectomy (which did not include the first lumbar ganglion) in all cases was, as usual, confirmed by microscopical study of the parts removed, as well as by the subsequent clinical history and sweating tests. This type of sympathetic denervation therefore produces neither sterility nor impotence, and so we can set at rest the minds of those who may hesitate to suggest lumbar sympathectomy, when otherwise advisable, on account of the fear of sterility.

It remains a philosophical paradox that a mechanism as characteristically parasympathetic in its functioning as sexual intercourse should require powerful sympathetic activity for its consummation. Possibly the paradox really lies in our conception of an essential opposition in the action of the two systems, an idea encouraged by much physiological teaching.

A comprehensive statistical and epidemiological review of typhoid fever in Egypt from 1935 to 1942 was contributed by Dr. A. M. Kamel and Dr. G. A. Messih to the *Journal of the Egyptian Health Association* for December, 1943. A reprint of this review can be seen in the library of the B.M.A.

A CASE OF MARCH HAEMOGLOBINURIA

BY

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March haemoglobinuria is a relatively uncommon condition characterized by the passage of free haemoglobin in the urine after marching or running. The condition was first described by Fleisher in 1881, and since then only 40 cases have been reported in the literature. All these have occurred in non-syphilitic males between the ages of 16 and 35 years. Because it is particularly likely to result from marching or running rather than other forms of exercise it tends to be found in armies more than in the civilian population. It attracted considerable attention in Germany in the last war, but so far very little in this country in the present war. The following case illustrates many of the characteristic features of the condition.

Case History

Private D., aged 21, medical category A1, an infantryman, reported on March 24, 1943, that for the previous three weeks he had noticed a red discoloration of his urine on exertion. He stated that he had first observed that his urine was "dark brown" five months before, not after exercise but after having stood on guard. About two months previous to reporting sick he had been on some manœuvres. The first two days were strenuous ones, but he noticed no "dark urine." However, on the third day, which was less strenuous, his urine was dark-coloured at mid-morning. Since then the same urinary abnormality has occurred after marching a few miles, after running two to three hundred yards, and sometimes after playing football. He was naturally worried about his condition, but had not had any discomfort, pain, or other untoward symptoms.

There was no history of nephritis, venereal disease, or any other illness except measles in childhood. Both parents and two brothers were alive and well, and there was nothing relevant in their histories. On examination he was seen to be a sturdily built young man. There were no significant physical signs. Posture was normal and without evident lordosis. There was no icterus. The liver was not enlarged and the spleen not palpable. Blood pressure was 110/78.

Investigation.—This was carried out in his unit and at Catterick Military Hospital. He was sent out with an orderly on a half-mile run, specimens of urine being collected prior to and ten minutes after exertion. Urine examination revealed:

	Before Exertion	After Exertion
Appearance	Clear yellow	Dark brownish-red
S.G.	1032	1032
Albumin	Nil	Large amount
Sugar	,,	Nil
Benzidine test ..	Negative	Very strongly positive
Spectroscope ..	,,	Oxyhaemoglobin present
Deposit	Few epithelial cells. No red blood cells, pus cells, or casts	Many granular casts. Few epithelial cells. No red blood cells, pus cells, or casts

After a short rest urine examination revealed no abnormality. Blood investigation showed: Erythrocytes, 4,300,000 per c.mm.; leucocytes, 5,500 per c.mm.—polymorphonuclears 61%, lymphocytes 33%, monocytes 4%, eosinophils 2%; haemoglobin, 12.87 g. per 100 c.cm. (83%); C.I., 0.97; film, normal appearance; Donath-Landsteiner reaction, negative; erythrocyte fragility, normal (haemolysis began in 0.44% NaCl and was complete in 0.28% NaCl); W.R., negative.

The patient then had half an hour's strenuous exertion riding a pedal cycle. Urine examination of specimens collected showed:

	Albumin	Deposit
Specimen 1 (resting)	Nil	Few epithelial cells. No red blood cells, pus cells, or casts
,, 2 (after ½ hour's cycling)	Trace	
,, 3 (,, 1 ,, rest following 2)	Faint trace	
,, 4 (,, 2 hours' ,, ,, 3)	Nil	

No blood pigments were present in any of these specimens. Benzidine reactions and spectroscopic examinations were negative.

As there was no evidence of renal damage the soldier was returned to full duty with his unit after hospital investigations. The only precaution taken was full dosage of sodium citrate before exertion in order to alkalinize the urine. The haemoglobinuria following exertion gradually decreased until four months after first reporting sick it had disappeared. In September the patient was sent on a mile run, but there was no trace of haemoglobinuria from this exertion. It is now reasonable to assume that spontaneous recovery has occurred. It is emphasized that, except for a period of two weeks in hospital, the patient has undertaken, without ill effects, all the rigorous duties demanded of an infantryman.

Discussion

Because the condition may start suddenly without evident reason it is likely to prove alarming not only to the patient but to the medical officer. But the close association with certain forms of exercise and with nothing else should as a rule be sufficient to enable the diagnosis to be made. The finding of granular casts in the urinary deposit may lead to a misdiagnosis of nephritis, but these also are present only during the actual periods of haemoglobinuria, and are not indicative of renal damage. The dark brownish-red urine may be mistaken for haematuria and lead to extensive investigation of the renal tract for calculi, etc.; but in haematuria the centrifuged urine becomes clear, all red cells being carried down in the deposit, whereas in haemoglobinuria the pigment cannot be removed by centrifuging. Two other forms of haemoglobinuria are occasionally encountered. Paroxysmal haemoglobinuria may occur in syphilitics on exposure to cold. In this condition the Wassermann reaction is usually positive, and it is characterized by a positive Donath-Landsteiner reaction. In the other—nocturnal haemoglobinuria—the haemoglobinuria occurs characteristically at night and may be so severe as to cause a gross anaemia. In the great majority of cases it is possible to differentiate between these three forms of haemoglobinuria by careful attention to the history of the case.

March haemoglobinuria is usually caused by exercise taken in the upright position. It tends, like orthostatic albuminuria, to be associated with the lordotic posture, and sufferers may show no haemoglobinuria if made to undergo equally strenuous exercise in the kyphotic position. Gilligan and Blumgart (1941) were able to demonstrate this, and it was shown in the present case. It was noted also by Fisher and Bernstein (1940) that a marathon runner who developed this condition tended to assume an unusually lordotic position when running. In a case reported by Witts (1936), however, the haemoglobinuria could be evoked by exercise on a bicycle ergometer, and in the present case there was no evident abnormal degree of lordosis.

In spite of its alarming symptoms, march haemoglobinuria is a benign condition. It is unlikely to lead to serious anaemia; it does not seem to damage the kidneys; and it nearly always clears up spontaneously in a few months or at most a year or two. It is not due to syphilis, and its cause remains unknown.

Summary

A case of march haemoglobinuria is reported.

The haemoglobinuria occurred only after exercise in the erect position.

The patient had no other symptoms and there was no interference with his efficiency as an infantryman.

Spontaneous recovery occurred.

I wish to thank Lieut.-Col. C. L. Cope, R.A.M.C., Officer i/c Medical Division, Catterick Military Hospital, for undertaking the hospital investigations and for his kind assistance in the preparation of the case report. I also wish to thank Col. J. C. McGrath, *M.C.*, A.D.M.S., for permission to publish.

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At the annual meeting of the Medical Insurance Agency held on May 31, with Sir Robert Hutchison, Bt., in the chair, Sir Kaye Le Fleming and Dr. Geoffrey Evans were elected to the committee of management for three years. Dr. J. W. Bone, Dame Barrie Lambert, and Dr. Henry Robinson were re-elected for a like period. Distributions to the medical charities were authorized, mostly under seven-year covenants, by which they will benefit in the following amounts: Royal Medical Benevolent Fund, £2,958 12s. 4d.; Epsom College (including £50 for Sherman Bigg Fund), £889 13s. 2d.; Squire Sprigge Scholarship Fund, £58 7s. 2d. The report of the committee of management showed that, in spite of the steady diminution of motor insurance and of new life business, the net profit is still slightly above the pre-war average. Sir Robert Hutchison was re-elected chairman, and the proceedings were concluded with a vote of thanks to him for services during the past year.

Medical Memoranda

Severe Tetanus with Recovery

The following case is of interest as an example of the efficacy of large doses of antitoxin given early in the treatment of tetanus, and emphasizes the need for wider knowledge of this method of combating the disease.

CASE HISTORY

A nursery foreman aged 65 lacerated the little finger of his right hand; he received no antitetanus serum, and the injury was treated at home with an ointment. Eight days after the accident he noticed stiffness of his jaw, and the next day this was followed by stiffness and pain in his back and neck. On the morning of the third day after the onset of symptoms he received 1,000 units of antitetanus serum intramuscularly and was sent to hospital.

On admission all the physical signs of tetanus were present except spasms. He received 30,000 units of A.T.S. intravenously soon after arrival, and three hours later 80,000 units by the same route and 40,000 units intramuscularly, followed by 60,000 units intramuscularly the next morning; the total dosage was thus 211,000 units in 24 hours. He was given 40 gr. of chloral hydrate by mouth; and his finger was dressed with hydrogen peroxide at frequent intervals. The following day he was opisthotonic, perspiration was profuse, and several spasms occurred mainly involving the muscles of the back. He was given 6 drachms of paraldehyde in oil per rectum. For the next 18 days he had 3.4 g. (0.06 g. per kilo) of tribromethyl alcohol (avertin) per rectum night and morning, making a total of 118 g. He was sufficiently conscious before each administration to allow oral feeding, and deglutition was at all times possible. He received about 2,000 calories a day. Although his fluid intake was 60 fl. oz. and his urine output 30 fl. oz. a day he was becoming dehydrated by sweating, and on the seventh day of the disease he was given intravenously 2 pints of 5% dextrose in normal saline. From the eighth day onwards he improved daily, and on the thirteenth day he could open his mouth more readily. Avertin was discontinued on the twenty-first day; he had three doses of 30 gr. of chloral hydrate on the next two days, after which sedation was discontinued. He got up for the first time one month after admission and was discharged a week later. His temperature rose to 99.4° F. on the twentieth and twenty-first days of the disease, but was otherwise normal.

COMMENT

The successful recovery of this case in spite of the onset of the disease eight days after injury, the onset of spasms only four days later, and the age of the patient, serve to emphasize the effectiveness of early administration of massive doses of antitoxin in the treatment of tetanus, and also to show that intrathecal injection and further administration are unnecessary. Too much stress cannot be laid on the importance of adequate sedation and at the same time the maintenance of sufficient nutrition and fluid intake.

PETER H. SCHURR, M.B., B.Chir.,
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Worthing Hospital.

Seven-year Cure in a Case of Carcinoma of the Bronchus

Apart from those cases in which early recognition may in suitable conditions render lobectomy with removal of the growth possible, the prognosis is hopeless whatever method of treatment is adopted, and a cure is rare. The following case is of interest in that non-radical treatment has produced a complete cure for the last 7 years.

CASE HISTORY

The patient, aged 53, a carver and gilder, was admitted to the Middlesex Hospital for the first time on March 19, 1937, complaining of a heavy feeling in the chest, with dyspnoea, for the previous 4 weeks; burning pain in the right scapula on coughing, for the last 7 days; long-standing harsh dry winter cough, worse recently, with scanty non-offensive sputum. He had lost 2 stone, and weighed 8 st. 12 lb. There were occasional palpitations, no haemoptyses or sweats, and no anorexia.

Clinical examination revealed poor nutrition, with septic teeth, but normal mucosae. No clubbing of fingers, cyanosis, oedema, or glandular enlargement could be demonstrated. Pulse, 100 regular; respirations, 20–26; B.P. 130/80. No enlarged veins were seen, and the trachea was central. Most physical signs were found over the right chest: diminished excursion; impaired percussion note at lower and mid-zones posteriorly and laterally, with absent breath sounds; weak breath sounds, bronchial in character, and crepitations towards the apex. Compensatory harsh vesicular breathing was present over the left chest. No abnormality was detected in the heart or C.N.S.

Investigations and Treatment.—Screening and *x* rays showed normal movement of the diaphragm, also an opacity in the right mid-zone which was posterior in position: conclusions—? early collapse. Lipiodol was found not to enter that area. The Wassermann reaction was negative. Bronchoscopy was performed by Mr. C. P. Wilson on April 6, 1937. A growth was found obstructing the dorsal division of the right lower lobe bronchus, and a portion was removed for microscopy. This showed infiltration of tissue by squamous-cell carcinoma. Ten days later bronchoscopy was repeated as before, and 9 × 1.6 mc. of radon in short Muir seeds were inserted round the site of the growth. The patient was apyrexial throughout. The erythrocyte sedimentation rate on admission was 6.6 mm./hour; one week before bronchoscopy it was 7.8 mm./hour, the day after bronchoscopy 8.2 mm./hour, and one week later 7.6 mm./hour. Convalescence was uneventful and he was discharged one month after admission. No post-operative irradiation was given.

A regular follow-up was maintained. Three months after discharge his weight was 9 st. 1 lb.; he was feeling much better and had only a slight cough. The pain had entirely disappeared, as had the dyspnoea. Radiographs showed the radon seeds still *in situ*. Since that time he has had frequent *x*-ray examination at 3 to 6 months' intervals. The previous opacity in the lung field disappeared, and no further change occurred in his physical state.

Readmission.—The patient was readmitted on Nov. 22, 1943, with gradually increasing symptoms of seven weeks' duration: cough and colourless sputum; moderate dyspnoea; pain in right chest radiating to the back. His weight was now 8 st. 7 lb. On examination there was weaker air entry, with a few rhonchi on the right side, together with harsh vesicular breath sounds on the opposite side. Nothing else relevant was observed. Radiographs of the chest showed no evidence of lung collapse. Three seeds were still present in the main bronchus and one lower down. Hb, 102%; W.B.C., 8,700; E.S.R., 25 mm./hour Westergren. Sputum: No malignant or tubercle bacilli seen; numerous organisms were present, the pneumococcus being predominant. Bronchoscopy was performed by Dr. J. E. G. Pearson under local cocaine anaesthesia and pentothal. Slight general constriction of the right lower lobe bronchus was found at the level of the middle-lobe opening. The area surrounding the dorsal lobe appeared somewhat pale—? fibrotic; the lumen of this branch seemed grossly constricted, and had been presumably the seat of the neoplasm as indicated by the original notes and diagrams. A portion of this area was taken, and microscopy revealed only respiratory epithelium, mucous glands, smooth muscle, fibrous tissue, and cartilage; no evidence of growth. The patient improved greatly with conservative treatment. He was discharged 3½ weeks after admission, and is now back at work in an aircraft factory.

COMMENT

The effects of treatment of carcinoma of the lung were recently estimated by the Clinical Cancer Research Committee (British Empire Cancer Campaign Annual Report, 1943), who showed that radium application, although used in fewer cases, appeared to yield better results than *x*-ray treatment, the expectation of life being increased by 13 to 22%, as against 6% in the latter.

I am most grateful to Dr. C. E. Lakin, Mr. C. P. Wilson, and Dr. J. E. G. Pearson for their permission to publish this case.

DAVID A. FERMONT, M.R.C.S.,
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Post-mortem Appearances of Malignant Tertian Parasites

In the description of a fatal cerebral case of malignant tertian malaria given in the *Journal* (1943, **2**, 814) difficulty was encountered in finding malaria parasites in sections of brain and spleen. Although textbooks stress the importance of making *films* at the time of post-mortem examination in order to detect parasites in the viscera, the following short account of the actual appearance of films from brain and spleen in such a case may be of use:

Films from Brain.—Thin smears from cerebral cortex are made in the post-mortem room. These are fixed and stained by Leishman's method. Chains of parasites are seen occluding the cerebral capillaries. The parasites stain blue, and each contains a dark mass of pigment. The course of the cerebral capillaries is in fact made strikingly clear by these characteristic chains of pigment-containing parasites. The red cells in which the parasites are contained are not readily distinguishable, however. Most of the parasites appear to be schizonts, and differential nuclear staining and division into merozoites can be seen in the thinner parts of the film.

Films from Spleen.—In spleen smears, similarly prepared and stained, the minute structure of the enormous number of sporulating schizonts is readily distinguished. Only some of the parasites, however, can definitely be located within red blood cells. The cytoplasm of the parasites is stained slaty blue, and the chromatin of the nuclei gives a beautiful metachromatic violet-red reaction. All stages in schizogony are encountered from early nuclear division to final liberation and separation of the individual merozoites, which can be seen migrating freely in the splenic pulp. Many of the merozoites are in "rosette" arrangement, grouped in the merocyte, and each merozoite is clearly seen to contain a violet-red chromatin particle and a slaty-blue cytoplasmic mass. The pigment of each merocyte is generally prominent as a brown-black concretion, often centrally situated. As many as 20 merozoites can easily be counted as emanating from some of the merocytes.

The above description illustrates the appearance of parasites of *Plasmodium falciparum*, which may readily be observed in films from spleen and brain within half an hour of completing post-mortem examination on a fatal pernicious cerebral case. The advantage of making films over sections in such cases is thus evident.

K. C. DIXON, Ph.D., M.B.,
Major, R.A.M.C.

Reviews

MENTAL HEALTH IN OLD AGE

New Goals for Old Age. Edited by George Lawton. (Pp. 210. 22s.) New York: Columbia University Press; London: Oxford University Press. 1943.

"Everybody wants to live long," said Talleyrand, "but nobody wants to be old." Recently it has been forced upon public attention that the proportion of the old to the young is rapidly increasing, a change which creates problems of its own. On the whole, the medical profession have not been greatly interested in these, despite the writings of Sir George Humphry and Sir Humphry Rolleston on the subject. A non-medical book by Cowper Powys entitled *The Art of Growing Old* is a notable illustration of how not to do it. The book before us, which is of more serious import, is a collection of lectures delivered by different authorities in a course on "Mental Health in Old Age" in New York, and suffers somewhat from the lack of unity inherent in this method. Yet the result is helpful if rather diffuse. Emphasis is rightly laid on the importance of thinking during middle life of what later life may have in store and of making adaptations accordingly. To pass from full occupation on a fixed date to complete inactivity is fraught with danger, as Elia found, "thinking I was happy, and knowing I was not. I was in the condition of a prisoner in the old Bastille suddenly let loose . . . I missed my old chains." As the editor of this volume puts it, "It is fear of ageing rather than the ageing process itself which often causes a fundamental loss in the mental realm, just as it does in the physical. Anticipating the loss of efficiency, we hasten the arrival of what we expect." The acceleration in the rate of social change imposes a strain on the old, for it renders the private worlds they have built up years ago increasingly incompatible with the external one. How the individual handled life in the past is the best clue to whether he is equipped to face the problems of advancing age. In a curious way the temperamental make-up of childhood, whether conducive to happiness or unhappiness, may reappear. It is well known that senescence has no fixed date, and heredity is undoubtedly the most important factor. Interesting instances are related here of identical twins, living under different conditions, ageing in precisely the same way at the same time. The date of senescence therefore appears to be inherent in the germ plasm.

"In the years to come we shall have to develop a whole repertory of ways to utilize the judgment and experience of older people, whether these be in an advisory or teaching capacity," for "the older individual retains almost unimpaired his capacity for solving mental problems of equal difficulty to those he could solve when younger." Though originality will decline, discrimination may increase. The field of interest is apt to contract, and the most subtle temptation for the old person is to excuse himself for yielding to such contraction on the score of age. For those unable to find interesting occupation for themselves schemes of occupational therapy are described which are in actual operation. An important section of the book is devoted to the subject of institutional homes of various grades, where some sort of community life can be enjoyed. Such are already in existence in this country also, as organized by Mrs. A. V. Hill and others, but the future will call for far more. In short, as the writers maintain, old age must be made to feel that it still has usefulness if it is to be "frosty yet kindly."

CONDITIONS OF MEDICAL WORK

An Industry of Health, Being an Exposition of Assumption B. By T. B. Layton, M.S., F.R.C.S. (Pp. 96. 3s. 6d.) London: William Heinemann. 1944.

The advertisement on the back of this book says that it is intended to "give the layman a background which will assist him to understand, assess, and criticize the proposals so that his views may be heard and his needs fully considered and met." Mr. T. B. Layton approaches his subject, which has a direct bearing on the White Paper proposals, in a novel way by drawing an analogy between medicine and ordinary industry. The latter has evolved from the solitary handicraftsman to the organized factory, and medicine is following the same course. Domiciliary treatment has lagged behind, and Mr. Layton says it can "no longer remain in the primitive condition where the individual does everything." The team work characteristic of a good hospital must be provided for, and the key position of the doctor giving domiciliary treatment is fully recognized.

He divides the doctors into clinicians and others, and these others into two classes: "one which produces the evidence for the clinician which he is unable to obtain himself with his six senses," and the other the laboratory worker and the administrator. Some acute comments are made on the place of the administrator which are relevant to the discussion of the White Paper. Mr. Layton insists that no clinical interference from the administrator should be allowed, and he thinks that "a want of clear distinction between clinical interference and clinical administration is the chief cause of the alarm that at present exists in the profession."

The chapters deal with every branch of medicine, including the various sections of the medical profession, ranging from the pharmacist, nurse, and dentist, to the almoner and receptionist. Of the nurse, he thinks that "for the rank and file of the nursing profession we should not ask for any standard of general education higher than that at which we aim for all. Girls from humbler homes make better nurses than those from the well-to-do. They have had experience in these fundamentals since infancy." He gives two chapters to the discussion of health centres, in which he strongly supports the need for experimentation. He believes there is room for both the State and the voluntary hospital. In the State hospitals the chief defects, he thinks, arise from the methods of control, on which subject he is very critical.

It is to be hoped that the book will be widely read, not only by the laymen for whom it is primarily intended, but also by those members of the profession who are anxious to consider every point of view in this important discussion, whether it comes from the idealist or from those who know by experience what they are talking about—as Mr. Layton does. He has had a long experience in both kinds of hospitals, and has taken an active part in National Health Insurance administrative work.

YEARBOOK OF SURGERY

The 1943 Year Book of General Surgery. Edited by Evarts A. Graham, M.D. (Pp. 736; illustrated. $6.00 or 19s.) Chicago: The Year Book Publishers, Inc.; London: H. K. Lewis.

The distinguished editor of this book comments on the retardation that war inflicts upon scientific progress, and suggests that the volume for 1943 may appear to be less rich in new ideas than previous ones. This is questionable, however, for this year's survey strikes us as containing much that is new and important, and we must not lose sight of the fact that, while no doubt much is lost to surgical progress by war, much is also gained, particularly in the field of traumatic surgery. Wars have brought about advances in wound treatment from Ambroise Paré's time onwards, and we might remark that the sulphonamides and penicillin have quickly come into their own in the present carnage. It is conceivable that in times of peace their general adoption might have been a much slower process. We should have liked to see more about penicillin in the present volume—there is only one brief reference to it as a prophylactic against gas gangrene. No doubt next year's survey will remedy this defect, however, and give us a comprehensive account of the results of its employment in the treatment of wounds and infections generally. With the exception of urology, gynaecology, and some parts of orthopaedics, recent contributions to all branches of surgery are reviewed. There are in this issue, perhaps, fewer of those small-print, pithy, and pleasing editorial comments than usual, but last year's innovation of what is called a "surgical practice quiz" is continued on the dust cover; it is a series of questions relating to recent developments, the answers to which are to be found in the text.

This is an important publication, to the appearance of which we always look forward. There are some excellent papers reviewed in the present issue which no busy surgeon can afford to neglect.

X-RAY DIAGNOSIS OF JOINT DISEASE

The Arthropathies. A Handbook of Roentgen Diagnosis. By Alfred A. de Lorimier, M.A., M.D. (Pp. 319; illustrated. $5.50.) Chicago: The Year Book Publishers, Inc.; London: H. K. Lewis.

This is one of a series of six handbooks dealing with the various branches of *x*-ray diagnosis. The foreword stresses the importance of the radiographer being given the opportunity of studying the clinical and laboratory data in order to arrive at a correct interpretation of the *x*-ray findings, and if this were the universal practice it would add greatly to their value. Following out this practice the author has described the radiological appearances at different stages of the various pathological conditions dealt with, and follows this with an account of the age and sex incidence, the history, physical and laboratory findings, and the clinical course. By this means he furnishes a picture of the disease, concise and yet complete to a remarkable degree, which cannot fail to be of great value not only to the student of roentgenology but also to the general practitioner. Every conceivable disease of the joints appears to have been dealt with in a thorough manner, and illustrated lavishly, as may be judged from the fact that the number of figures—mainly reproductions of radiographs but with some anatomical diagrams—amounts to 678. The importance of studying the appearance of the soft tissues as well as the bony structures receives prominence, and a very useful feature is the separation of the likely changes from those which may only possibly be present.

The illustrations are on the whole good and clear, the matter is compactly arranged, and supplies a mass of information in a remarkably small space and at a very reasonable cost. The book is one that can be strongly recommended to all who are concerned with the diagnosis of bone and joint diseases, and will be found a most useful addition to the library of the general practitioner.

Notes on Books

As the editors of the new edition of *Textbook of Medical Treatment* (E. and S. Livingstone; 30s.) truly remark, it is a striking commentary on the rapidity of advance in medical therapeutics that the publication of its third edition only two years after the second should involve extensive changes in the text. The difficulty of keeping such works up to date and the inevitable delays in publication are illustrated by the absence of penicillin from the index. Among the sections that have been completely or partly rewritten are those on cerebrospinal fever, sprue, haemorrhagic and haemolytic diseases, blood transfusion, diabetes insipidus (where pitressin tannate has proved a real advance), parathyroid tetany (where vitamin D or dihydrotachysterol has been shown to be so superior to parathormone therapy that it might well be abandoned), and essential hypertension, of which it is justly said that its complications are more devastating than those of malignant disease. As might be expected, considerable emphasis is laid on peptic ulcer, now so prevalent, and on tuberculosis, now on the increase. The invasion of the surgeon into the chest continues with benefit. There is evidence throughout of careful revision, and we can cordially repeat the welcome we extended to the earlier editions. Particularly do we appreciate the explicitness of the directions given and the avoidance of vague and ambiguous statements, which greatly enhance the value of this excellent work.

The Year Book of General Therapeutics, 1943 (Year Book Publishers of Chicago and H. K. Lewis; 19s.) aims at collecting in one handy volume information on diagnosis and treatment published during the year. The editor is to be congratulated on the result, for the book is readable and informative despite the wide range of subjects. The matter is essentially a series of abstracts, but as those relating to one subject are collected together, and are written with much fuller explanation than abstracts usually are, they provide an interesting text. There is a long chapter on the sulphonamides, and another on penicillin. Matters dealt with prominently are the treatment of burns, malaria and syphilis, blood transfusion, blood diseases, hormones and vitamins. The book offers a solution to the doctor's problem of keeping up with new work, and, provided that as years go by it retains its present convenient size, it is likely to have a steadily expanding sale.

Mr. H. J. B. ATKINS'S book *After-Treatment*, a guide to general practitioners, house officers, ward sisters, and dressers in the care of patients after operations, was favourably noticed in these columns on July 25, 1942. A second edition has now appeared (Oxford: Blackwell Scientific Publications; 18s.). There are two new chapters, one on post-operative treatment of children and another on rehabilitation. There are also new sections, on post-operative coronary thrombosis and on the management of the diabetic patient in the post-operative period. The section on head injuries has been brought up to date and now incorporates much of the teaching of the Oxford school. The book in its revised form should be very welcome at the present time.

Preparations and Appliances

AN IMPROVED SACCHAROMETER

Dr. J. E. STANLEY LEE, F.R.F.P.S., F.R.C.S.Ed., medical superintendent, New Cross Hospital, Wolverhampton, writes:

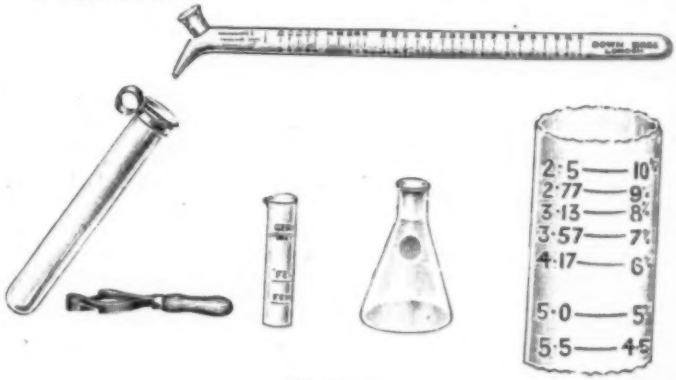
An apparatus for the rapid estimation of sugar in urine by Fehling's method using a modified Bink's burette was described by Carwardine,[1] but the graduations showing the amounts of urine and water to be added are not clearly indicated, with the result that inaccurate findings are obtained and the use of Fehling's method makes it extremely difficult to ascertain the exact end-point.

In order to overcome these difficulties, an improved model has been devised and adapted for use with Gerrard's cyanocupric method, which depends upon the fact that the colourless double cyanide of potash and copper is capable of holding cuprous oxide in solution. If, therefore, Fehling's solution is titrated with a sugar solution in the presence of this cyanide, the blue colour fades gradually, no precipitate being thrown down. The colourless end-point is thus very sharp, and, as there is no tendency to re-oxidation, the process may be safely conducted in an open flask.

The saccharometer tube, which has a double scale (c.cm. on the left and sugar percentages on the right), is so graduated that the urine is diluted to 1 in 10; the formula being:

$$\frac{\text{c.cm. diluted urine used}}{25} = \%\ \text{sugar in specimen.}$$

No cork is necessary with the present apparatus because the lumen of the nozzle has been adjusted to a convenient size, and an Erlenmeyer flask with a long holder has been chosen with a view to reducing the risk of accidents due to escape of the boiling solution.



Directions

1. Fill measure to mark "GW" with Fehling-Gerrard's solution (Fehling's solution 1 part, Gerrard's solution 3 parts).
2. Pour into flask (or large test-tube).
3. Fill burette to "U" with urine, dilute by adding water to "DU," place finger over opening and mix well by inverting the burette.

Estimation

1. Boil flask (or large test-tube), and, whilst boiling gently, add diluted urine from the burette until the blue colour is discharged.
2. Hold burette vertically and read off percentage of sugar.

When the quantity of sugar in the urine is very small, the burette can be filled with undiluted urine to the mark "DU," when the percentage obtained should be divided by 10.

A mixture of Fehling's solution 1 part and double cyanide 3 parts will keep for a number of weeks[2] and can be obtained from British Drug Houses, Ltd. Provision has also been made for estimation by Fehling's method, the measure being graduated for Fehling's solution Nos. 1 and 2, and for dilution to mark "GW" by water instead of Gerrard's solution.

I wish to thank Messrs. Down Bros., Ltd., who have made the apparatus for me and also provided the necessary electro for the illustration, and Mr. A. W. Farmer, laboratory technician, New Cross Hospital, Wolverhampton, for his technical asistance.

[1] *Lancet*, 1894, **2**, 1165.
[2] Hutchison and Hunter, *Clinical Methods*, 9th edition, p. 371, Cassell, 1932.

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ARTIFICIAL RESPIRATION

Though artificial respiration is a universally employed treatment that often proves life-saving, its investigation has been somewhat neglected in the past; but interest in the subject has been renewed in recent years, as exemplified by the important work of Hemingway and Neil reported in our opening pages this week. Yandall Henderson used to say that in America many laymen, such as ambulance personnel, members of the police force, and workers in high-tension plants, were often better trained to carry out artificial respiration than were some doctors; in fact, in one great American city the public were advised when faced with a case of asphyxia to ring up the fire brigade first and the doctor second. Without accepting Henderson's criticisms of our American colleagues we can say that British doctors nowadays are fully alive to the importance of being thoroughly familiar with artificial-respiration technique. But there still remains much doubt as to which is the best method to employ, and, in fact, there is uncertainty about the criteria by which any method of artificial respiration should be judged.

A sharp distinction must be drawn between the problems involved in treating a case of gradually progressive respiratory paralysis (like that complicating anterior poliomyelitis) and those of acute respiratory failure due, for example, to drowning, inhalation of irrespirable or poisonous gases, suicidal and accidental overdoses of narcotics, and electrocution. In the chronic group there is usually ample time to use a breathing-machine. In the acute group not a moment may be lost, and the treatment must be capable of being carried out by the first instructed person on the scene and require the use of no more equipment than can be readily improvised almost anywhere. There is another fundamental difference—which is often overlooked—between the chronic and acute forms of respiratory failure. In the former machine-breathing is instituted while the circulation is functioning normally; if the mechanical respiration is efficient no circulatory derangement develops and the blood-flow to all the organs remains normal. In acute asphyxia, on the other hand, failure of the circulation and of the central nervous system follows rapidly in the train of respiratory arrest. The body is unfortunately quite unadapted for dealing with complete or even very severe oxygen lack. Food starvation can be withstood for weeks and water deprivation for a few days; but grave anoxia "stops the machine and wrecks the machinery" (to use J. S. Haldane's unforgettable phrase) in a matter of minutes. Let us consider the sequence of events in drowning, for example. After one minute or so of complete lack of oxygen consciousness is lost; within another minute or two the respiratory centre, which initially was stimulated, ceases to function. The vasomotor centre is more resistant and may maintain vasoconstriction for a little longer, but soon it too fails, and full peripheral vasodilatation sets in, with a resulting fall of blood pressure to about 40 mm. Hg. Most important of all, we must always remember that the heart—unlike skeletal or smooth muscle—can function normally for only a short time in the absence of oxygen; it has no type of anaerobic metabolism to fall back on. The force of the heart-beat in severe anoxia rapidly weakens and the chambers greatly dilate; the output into the blood vessels is reduced to a trickle, and the blood-flow to the organs almost ceases. When fibrillation of the ventricles develops the chances of recovery are of the slenderest. Acute asphyxia thus presents a combination of respiratory, circulatory, and nervous-system failure with which the treatment employed must cope effectively if it is to succeed.

There is no disagreement as to the immediate action which should be taken. As Hemingway and Neil emphasize, "the Schäfer method should be immediately instituted when resuscitation is undertaken," and "no time should be lost while preparations are being made for the use of any other method." Incidentally, it should be made clear to laymen that in the Schäfer method pressure is not applied over the lower part of the chest but over the lumbar region; compression of the abdomen so brought about drives its contents on to the diaphragm, which diminishes the size of the thoracic cavity and causes expulsion of air from the lungs. The active phase is thus expiration. When pressure on the loins is released the diaphragm descends once more and air is drawn into the chest. In normal subjects who have voluntarily suspended their respiration it is easy to demonstrate that Schäfer's method produces an adequate pulmonary ventilation; but it has been argued that some degree of active co-operation is being supplied by the conscious subject. To avoid this complication experiments have been performed during the apnoea which follows a bout of vigorous over-ventilation. Under these conditions a disappointing degree of lung ventilation is obtained, which is said to contrast poorly with that yielded by the Silvester method. But in over-ventilation apnoea there may be a good deal of muscular rigidity which constitutes a mechanical hindrance. Ideally to test artificial-respiration methods, observations should be made on the fresh, warm, non-rigid cadaver or on cases of respiratory failure from overdosage with anaesthetics or narcotics; but as yet data from such sources are very scanty. It has been argued theoretically against the Schäfer method that in unconscious subjects muscle tone is lost, that consequently the diaphragm will not recoil (as normally) into the abdomen when pressure is removed from the loins, and that effective inspiration will therefore not be produced.

The chief competitor of the Schäfer method in this country is the rocking method introduced and persuasively advocated by F. C. Eve. It only requires some kind of stretcher and fulcrum; it is easily and conveniently carried out aboard ship. The principle of the method is straightforward enough. When the head is tilted down the abdominal viscera fall on to the diaphragm and compress the contents of the chest, producing expiration; with the feet down the viscera pull the diaphragm back into the

abdomen; the thoracic cavity is enlarged, and inspiration results. It is claimed that even the toneless diaphragm responds adequately to these mechanical forces. Hemingway and Neil have compared the efficiency of the Schäfer and rocking methods in dogs in which respiration was abolished by deep anaesthesia or section of the upper cervical spinal cord; in both groups muscle tone, including that of the diaphragm, was practically absent (as is the case in asphyxiated human subjects). The volume of the tidal air was found to be generally smaller with the Schäfer method, the mean advantage in favour of the rocking method being 50% and most pronounced when the loss of muscle tone was most complete. These results lend substance to the criticism of the Schäfer method already referred to.

But it must be remembered that resuscitation demands more than just effective pulmonary ventilation; the oxygen introduced into the lungs must be transported by the circulation, especially to the brain, heart, and kidneys. As only a minimal circulation is present in asphyxiated patients, and life is being maintained most precariously, quite small differences in the circulatory state produced by the resuscitation technique may be of decisive importance. Hemingway and Neil have shown clearly that even with equal degrees of pulmonary ventilation the rocking method is associated with a greater cardiac output and therefore with a better blood-flow to the organs, and with a higher level of oxygen consumption. These important advantages of the rocking method are largely due to obvious mechanical factors. In the head-down phase the venous blood drains out of the legs and abdomen into the heart, and the arterial blood-flow into the head is facilitated. During the feet-down position venous blood drains out of the head, and the lower part of the body is fed with arterial blood, though the venous outflow from that region is impeded. Some of these advantages are lacking in the Schäfer method. A good case has been made out experimentally for changing over from the Schäfer to the rocking method as soon as suitable facilities are available. It seems that an angle of rock of 45° is adequate; employing a rate of 8 to 9 rocks per minute, the 7-second cycle might be divided into 4 seconds head down and 3 seconds feet down to obtain the full circulatory benefits of the head-down position. It is to be hoped that the circulatory changes during resuscitation in man will receive more careful consideration in the future.

THE WAY OF THE INVESTIGATOR

"Every physiologist who is more than a technician is something of a philosopher because he is constantly dealing with the problem of life, and sooner or later he will feel the urge to step out of the laboratory and to look at the field as a whole." In these words Dr. H. E. Sigerist introduces his translation of Maurice Arthus's essay on *The Philosophy of Scientific Investigation*.[1] Early in life Prof. Arthus fell under the spell of Claude Bernard's methods and applied them faithfully. Bernard, when he reached some conclusion, criticized it with the firm determination to demolish it if possible. When in spite of all efforts he did not succeed in pulling it down, then and only then did he accept it as valid and publish it. This rigorous method if generally followed would probably diminish the output of scientific literature considerably. Arthus became known in this country in the last decade of the nineteenth century for his work on the coagulation of blood, but his main work was on anaphylaxis. He would stress to his students that though a fact is always interesting it only acquires significance if properly interpreted, just as a work of art acquires its complete value only if properly placed and properly lighted. Hence the experimentalist attempts an interpretation—that is, he makes a hypothesis—which should be merely regarded as a question, calling for further inquiry. "Seek facts and classify them—and you will be the workmen of science. Conceive or accept theories—and you will be their politicians." For, as he points out, once a theory is accepted it is likely to become a dogma which must be defended rather than proved. He sharply contrasts the rigidity of the fact with the plasticity of its interpretation. The saying that "the exception proves the rule" is often repeated, forgetful of the fact that "proves" was here used in the old sense of "tests" or "probes." It is indeed the exception that tests the rule, and this Arthus clearly recognized. "A well-outlined subject, a question clearly put, an experiment able to lead to a unified solution, a categorical answer—these are some of the conditions required for a fruitful experimental investigation."

It is interesting to compare this with the method recommended by Francis Bacon in his famous *Novum Organum*, so long regarded as the introduction of modern scientific method. Historically this is not correct, for William Gilbert (the quatercentenary of whose birth has been recently commemorated) was beyond doubt the father of experimental science in England, and his *De Magnete* published in 1600 antedated all Bacon's theoretical contributions to the subject. Without belittling Bacon's influence, it is fair to say that we are now in a better position to assess the value of his contributions than were those who were dazzled by his great name and fame. He was right in believing that the collection of authenticated facts was the urgent need of his age, but wrong in believing that the results would emerge by passing all the facts through a logical mill. Prof. Major Greenwood recently went so far as to say that "Bacon was not a much more useful teacher or textbook writer than the despised ancients." This is severe indeed, but the most serious defect in Bacon's system was his claim that it went far to level man's wits and left little to individual excellence. This might appeal to some of our modern planners, but never was there a greater fallacy. It leaves out of account the scientific use of the imagination. Arthus, on the other hand, believes in this so long as it is carefully controlled by the test of further experiment. Bacon believed in induction as sufficient alone; Arthus recommends induction with a collection of facts and then deduction from the hypothesis thus reached, to be tested by a second process of induction before a generalization is reached.

[1] *Maurice Arthus's Philosophy of Scientific Investigation.* Preface to *De l'Anaphylaxie a l'Immunité*, Paris, 1921. Translated from the French, with an introduction by Henry E. Sigerist. (Pp. 26; $0.75.) Baltimore: Johns Hopkins Press.

The scientific investigator, in Arthus's view, requires more than intelligence: he needs character. His path is littered with obstacles, and he must have tenacity, with the capacity to distinguish this from the obstinacy that persists in exploring a blind alley. He must also be able to obtain stimulus from his teacher without surrendering his independence. The way of the investigator, as he sees it, is hard, but the rewards for following it faithfully are satisfying.

BOVINE SERUM FOR TRANSFUSION

Reports from the battle fronts and from bombed cities have all emphasized the urgent need for early and often large transfusions for about 13% of casualties. For this purpose there has so far been no satisfactory substitute for human blood or its derivatives. It would clearly be an enormous advantage if animal proteins prepared from animal serum could be used, since they are available in almost unlimited supply, and with present events such abundant supplies would be most welcome. Both in this country and in the U.S.A. attempts have been made to employ ox serum for transfusion purposes. F. R. Edwards[1] has already reported in this *Journal* a preliminary clinical trial of a preparation of despeciated bovine serum. He found that treatment of bovine serum with sodium sulphate to remove the globulin fraction, which theoretically should contain most of the antibodies, resulted in a solution of albumin which gave severe reactions in two volunteers. He then tried to destroy the antibodies by heating, coagulation being prevented by addition of formaldehyde and ammonia. The final preparation contained approximately 5 grammes of protein per 100 c.cm., and was, he suggests, "a mixture of albumin and an agglomerated form of protein." The results of the administration of this fluid in amounts varying from 400 to 2,400 c.cm. to 26 patients with a variety of conditions are given in tabular form, and more detailed notes on two of the patients only are also available. Pyrexia and vomiting were recorded in three instances only. Considering that the majority of the patients were medical rather than traumatic cases, the lack of any reaction is most remarkable.

Much work on somewhat the same lines has been carried on in the U.S.A. Both whole ox serum and purified albumin prepared by Cohn's process have been used, with extremely conflicting results. Heyl, Gibson, and Janeway[2] have studied the effects of concentrated solutions of human and bovine serum albumin on blood volume after acute loss of blood in man. They describe no toxic effects other than the appearance of urticarial wheals from the ox concentrate, and claim that there was no significant difference in the effect on blood volume after the administration of ox or human albumin. The rise in plasma volume in all cases was much greater than the volume of the concentrated albumin solution injected, indicating, they conclude, that extra fluid had been added to the circulating plasma from the body's own reserves. Since extremely rapid overdilution may occur immediately after haemorrhage in healthy individuals without the administration of albumin preparations (Dyson, Plaut, and Vaughan[3]), it is doubtful whether this interpretation of their results is correct. Dunphy and Gibson[4] have also reported experimental studies on dogs which suggest that bovine serum albumin may be as satisfactory as dog plasma in maintaining plasma volume and blood pressure in experimental shock. The detailed and careful immunological studies published by Janeway[5] would, however, suggest that extreme caution should be exercised in the use of animal blood derivatives, however attractive they may be on theoretical grounds. It is clear that bovine serum will maintain blood pressure as well as human serum, and that it can be utilized by the human body, but it is equally clear that preparations now available may cause highly unpleasant and in some instances delayed reactions not unlike serum sickness. This is not surprising when it is remembered that, though bovine and human albumins prepared by the low-temperature alcohol-water method have almost identical chemical properties, they differ much when tested immunologically. Further, it is clear that cross-reactions occur between bovine albumin antisera and therapeutic horse sera used as antigens. This is of practical importance because so many horse antisera are employed to-day in the treatment of disease. Janeway, for instance, reports two subjects who had previously had horse serum, followed by severe sickness; they were given 8 and 12 grammes of bovine albumin respectively: one developed very severe serum sickness, and the other a strongly positive skin test for bovine alpha and beta globulin.

As Heyl and his colleagues themselves say: "No statement regarding the safety for intravenous use . . . can be made until more extensive clinical tests have been completed in order to determine to what extent and under what circumstances it will be safe to use a protein of animal origin in man." The use of such proteins is clearly not an immediate practical proposition. The millions of blood donors enrolled in the Emergency Medical Service still have an urgent job to do for the country.

[1] *British Medical Journal*, 1944, **1**, 73.
[2] *J. clin. Invest.*, 1943, **22**, 763.
[3] *Quart. J. exp. Phys.*, 1944, **32**, 255.
[4] *Surgery*, 1943, **14**, 509.
[5] "Immunological and Clinical Studies on Purified Proteins of Human and Animal Plasma," Chap. XXI, in *Blood Substitutes and Blood Transfusion*, by S. Mudd and W. Thalhimer, Charles C. Thomas, Springfield, Ill., 1942, p. 184.

REHABILITATION OF INJURED MINERS

The development of rehabilitation for injured miners throughout the coalfields of Great Britain was the task accepted by the Miners' Welfare Commission in the autumn of 1942. Mr. R. Watson-Jones was appointed honorary director of rehabilitation, and he was assisted by a medical advisory committee. Rapid progress was made. Seven residential rehabilitation centres have already been opened in England, Scotland, and Wales; others are in preparation; six special hospital centres are available, and out-patient facilities are being developed. There is now provision for half a million miners, and within the next few months the requirements of over 90% of the industry will have been met. The special centres are provided with *x*-ray and plaster rooms, gymnasiums, treatment cubicles, recreation rooms, and playing fields. Surgeons are appointed jointly to the rehabilitation centre and to the associated fracture A hospital; they are assisted by physical training instructors, occupational therapists, and physiotherapists. Special members of the staff are responsible for problems of resettlement and retraining; management is governed by committees composed equally of miners and mine owners. The medical rehabilitation committee of the commission, responsible for central planning and administration, has been strengthened. Members appointed under the chairmanship of Mr. Watson-Jones include: Mr. H. A. T. Fairbank and Prof. H. Platt (Ministry of Health), Dr. Donald Hunter (industrial medicine research), Dr. S. W. Fisher (Ministry of Fuel and Power), Sir Robert Stanton Woods (physical medicine), Mr. Alexander Miller (vice-chairman of committee), Mr. I. S. Smillie (Gleneagles), Mr. F. W. Holdsworth (Sheffield), Mr. C. S. Walker (Stoke-on-Trent), and Mr. E. A. Nicoll

(consulting surgeon to the committee). Mr. Trevor Evans is surgeon to the South Wales centre, Mr. J. B. Leather of Birmingham consulting surgeon to the Midlands centre, Mr. Gordon Irwin of Newcastle consulting surgeon to the Northumberland and Durham centre, and Mr. W. S. Diggle of Liverpool consulting surgeon to the Lancashire, Cheshire, and North Wales centre.

The physical hazards of mining are greater than in any other industry. One miner in every five sustains injury every year. This must be accepted by the miner as part of his contract, and he has the right to expect the highest possible standard in the treatment of his injuries. It is therefore with satisfaction that recent developments in the treatment of injured miners can be recorded—developments which will serve as an example to other industries in future years.

PREFRONTAL LEUCOTOMY

Prefrontal leucotomy has now been practised for seven years in the U.S.A. and for over three years in this country. Enough experience has been gained for sober stock to be taken of its position, and Fleming's scholarly paper[1] is both welcome and timely. Watts and Freeman[2] have analysed the results of 136 personal cases: of 62 cases of involutional depression 37, at the time of writing, were employed and 11 others were at home; of 30 obsessive-tension states 21 were employed and 7 others at home; and of 31 schizophrenics 15 were employed and 11 others at home. Ziegler,[3] in a survey of 618 cases from 18 centres in the U.S.A. and Canada, finds that 214 recovered and 251 were known to be working part or full time. Comparable results have been found in this country. Bearing in mind that it is usual to employ leucotomy only in cases of bad prognosis and mainly after other forms of treatment have failed, these figures are encouraging. The operative mortality is not high: in Ziegler's 618 collected cases it was under 2%, in Watts and Freeman's series 2.2%, and McKissock[4] has had only 3 deaths in over 200 operations. Neurological sequels are few, the only common one being epileptic fits, which occur in some 10% of cases. Changes in personality may follow, but for the most part consist of a welcome release from emotional tension. This release may bring about a rather too care-free attitude to life. Freeman and Watts[5] observe that "some remain somewhat indolent, lacking in the imaginative capacity to see for themselves what needs doing. Others are freed from the restraints imposed by timidity, sensitiveness, or embarrassment, and they can carry on quite undistracted by their inner thoughts." There may be in some "a certain abruptness in manner and speech, a certain buoyancy, an enthusiasm, an ingenuous personality, even an exuberance, that is at times rather trying on the close associates." In judging the advisability of leucotomy these are the main dangers to be weighed against the degree of severity and intractability of the disease in each individual case. Kisker[6] deplores that the operation is condemned by some on the ground of vague "principles."

In addition to its therapeutic value, leucotomy has given an impetus to researches on brain function. Freeman and Watts see the main personality change resulting from leucotomy as a lack of ideation concerning the self and the future of the self. To them this loss of self-consciousness and of personal imaginative foresight seems to indicate that these attributes are especially highly integrated functions of the frontal areas. Cobb[7] criticizes these conclusions. He does not believe that any special quality of behaviour is lost, but that the multiple association paths, normally traversed before civilized man's speech or action, are short-circuited by section of the fronto-thalamic fibres. He considers "long-circuiting" to be the essence of the problem. Using Fulton's term, "long-circuiting," to describe "the mechanism that allows spread of impulses from one reflex level up and down to other segments," he points out that it allows for an enormous increase in association, gives higher integration, leads to delayed action, and allows the past experience of an individual to affect his behaviour. In Cobb's view it would seem that the patient who has undergone leucotomy is relieved of his morbid type of cerebration, not by elimination of any specialized centre for foresight or other quality of thinking but by a general cutting out of association circuits. By this interpretation he explains quite logically Freeman and Watts's finding that the more white matter is cut the better the results.

1 "Recent Progress in Psychiatry," *J. ment. Sci.*, Jan., 1944, p. 486.
2 *Southern med. J.*, 1943, **36**, 478.
3 *Amer. J. Psychiat.*, 1943, **100**, 178.
4 Personal communication, May, 1944.
5 *Amer. J. Psychiat.*, 1943, **99**, 798.
6 Ibid., 1943, **100**, 180.
7 *Borderlands of Psychiatry*, 1943, Cambridge, Mass., Harvard Univ. Press.

ANOMALIES OF LEFT COMMON ILIAC VEIN

Almost forty years ago McMurrich[1 2] described a series of obstructive anomalies of the mouth of the left common iliac vein. These observations have now received very complete confirmation in a recent paper by Ehrich and Krumbhaar[3] which records the detailed examination of 399 cases. The left common iliac vein showed a definite obstructive anomaly in no less than 23.8% of the cases, and a further 4% were possibly slightly obstructed. These obstructions were in the nature of fibrous thickening and adhesions, and all occurred at the mouth of the left common iliac vein at its entry into the inferior vena cava. The obstructing lesions could be analysed into five groups: thickenings of the outer part of the vein wall; similar thickenings, with one or more secondary venous channels passing along the outer wall of the vein; antero-posterior or other bands crossing the mouth of the orifice; obstructions affecting the medial vein wall; and, finally, a miscellaneous group of lesions. Only exceptionally was there any narrowing of the vein lumen immediately below the obstruction. The histology of the lesions is not reported in any detail, but the authors state that the obstructed regions showed a great deal of elastic tissue, some collagenous tissue and smooth muscle cells, but no inflammatory cell infiltrations or irregular arrangement of scar tissue. An analysis of the age incidence suggested that few, if any, of the obstructing lesions were developmental in origin, but that almost all appeared during the growth period, and rarely after adolescence. An item of considerable interest is the fact that the obstructions were at the point where the right common iliac artery crosses the left common iliac vein. Ehrich and Krumbhaar think that the anomalies they record have an important clinical significance in connexion with the greater frequency of deep venous thrombosis in the left lower limb than on the right side. On the other hand it is impossible to agree with them when they suggest that the venous anomaly has any bearings upon idiopathic varicosity, which does not show such striking difference in incidence between the two sides.

We much regret to announce the death of Prof. J. Shaw Dunn, M.D., who had held the chair of pathology in the University of Glasgow since 1936, in succession to Sir Robert Muir. Before returning to Glasgow in 1931 as Notman professor he had been professor of pathology in the University of Birmingham and in the Victoria University of Manchester. Our obituary notice will appear in a later issue.

1 *British Medical Journal*, 1906, **2**, 1699.
2 *Anat. Rec.*, 1906–8, **1**, 78.
3 *Amer. Heart J.*, 1943, **26**, 737.

Reports of Societies

THIOURACIL FOR THYROTOXICOSIS

A meeting of the Section of Experimental Medicine and Therapeutics of the Royal Society of Medicine was held on June 13, under the chairmanship of Dr. R. D. LAWRENCE, for a discussion on thiouracil in the treatment of thyrotoxicosis.

Clinical Experience in 32 Cases

Prof. H. P. HIMSWORTH reported on a clinical experience of this drug in 32 cases at University College Hospital. Of these, 26 were under his direct care and 22 had been observed beyond the stage of initial treatment. The longest period of observation had been 10 months, the shortest 10 weeks. Seven of the cases were started on thiourea, which alone was available at that time, but were turned on to thiouracil as soon as possible. The latter did not produce the vomiting, conjunctivitis, and smelling breath associated with thiourea, otherwise the drugs seemed to be alike. The dosage of thiourea was 1 gramme three times a day, and of thiouracil 0.2 gramme five times a day. The average duration of the initial course was 29 days. In no case did the treatment fail to effect conspicuous improvement, and none became drug-resistant. All patients gained weight, the basal metabolic rate and the pulse rate fell, and the plasma cholesterol went up. Sweating, skin flush, and nervousness disappeared, and diarrhoea, if present, stopped. In one of the two patients who had fibrillation, regularity was restored during treatment. The exophthalmos was not noticeably altered, and the goitre appeared in the majority of the cases to be unaffected; in two there was an increase in the size of the goitre during treatment, and the patient had to be operated on. The drug acted neither immediately nor uniformly upon the symptoms. There was little change in the pulse for a fortnight after treatment had started, but by the end of a month the pulse became normal. The first symptom to disappear was the skin flush, the last the quickened pulse. Three cases said to be resistant to thiouracil had been referred to him, but in each of them he found improvement, which indicated that the disease was coming under control, and the conception of resistance was evidently based on the fact that the pulse was still rapid.

From this it appeared that under thiouracil the symptoms and signs of thyrotoxicosis could be rapidly and effectively controlled, and the results of the initial treatment were at least comparable with those of surgery. Far smaller doses were needed for maintenance than for establishing control. One patient was put on a maintenance dose only one-fifteenth of that given at the beginning, and yet maintained increased weight, and there was no return of symptoms. The majority of patients were able to resume full work after a period of up to three months. It was too early to say whether treatment by thiouracil could be given up and the patient remain well, but two of the patients who had gone off thiouracil, for 7 and 10 weeks respectively, had maintained their improvement.

Untoward Effects of the Drug

If thiouracil had no untoward effects it would be reasonably certain that here was a cure for Graves's disease, but unfortunately it had an untoward effect, and only experience would show whether the drug was more dangerous than operation for removing the gland. Symptoms of overdosage must be distinguished from manifestations of idiosyncrasy. By the former he meant such symptoms as would be produced in any patient by giving too much of the drug. Such symptoms were divisible into two groups—gross overdosage manifesting itself by an increase in the size of the gland, and chronic overdosage in which the symptoms were more subjective. The patient might go on perfectly well on a small dose of thiouracil for months, and then come up with a condition superficially suggesting hypothyroidism, though there were no sure indications of that. This condition coincided with a sharp jump upwards of the blood cholesterol. To avoid these reactions the dose should be reduced to the minimum needed to maintain the weight.

Symptoms of idiosyncrasy appeared capriciously: fever, rashes, enlargement of lymph glands, swelling of legs and feet, and blood changes had all been reported. These appeared within a week or fortnight after starting the drug, and did not appear late in maintenance treatment. The most serious manifestations of idiosyncrasy were agranulocytosis, leucopenia, and thrombocytopenia. In the 32 cases mentioned there had been 2 of leucopenia and 1 fatal case of agranulocytosis. This patient had had 1 gramme of thiouracil a day for a month and proved completely resistant; she had previously been given iodine for two years on end. The dose was then pushed up to 2 grammes, and the thyrotoxicosis responded, but eight days after her discharge she developed a whitlow, and after that shivering and other signs; she was readmitted and given blood transfusion, but contracted bronchopneumonia and died. It was quite clear that there was some question of idiosyncrasy involved. The drug did not cause a steady depression of the white cells in all people. Of Prof. Himsworth's own 22 patients the white blood count on admission had ranged from 4,000 to 10,000, average 6,500, and the polymorphonuclears from 42 to 80%, average 59%. After one month's treatment the white blood count ranged from 3,000 to 11,000, average 6,800, and the polymorphonuclears from 40 to 81%, average 60%. When leucopenia appeared it appeared suddenly in patients whose previous blood counts had been normal. There was an indication that the development of agranulocytosis was influenced by the amount of drug given, not the total spread over many months, but the intensity of the daily dosage. They were now hoping to avoid trouble by giving small doses—0.5 gramme a day during the initial period and 0.1 or 0.05 as quickly as possible. The treatment was experimental, and patients should not be given this drug except under close, detailed, and continual investigation.

Nine Documented Cases

Mr. CECIL A. JOLL (whose paper was read for him in his absence) said that opinions at this stage could be scarcely more than tentative. Some of the more optimistic statements made in this country were, at any rate, ill judged. The name "thyrotoxicosis" embraced a number of diseases, of which Graves's disease was best understood, easiest to diagnose, and in some ways easiest to treat. The knowledge of thiouracil had been gained in connexion with Graves's disease, and little or nothing was known about its application in the larger and more insidious and hazardous group of cases included under the heading of secondary thyrotoxicosis. The number of cases of thiouracil treatment which his team had been able to observe was between 20 and 30, but many of these patients were not prepared to remain under direct observation for as long as was thought desirable, and he limited his paper to 9 cases which were fully documented. So far as the others were concerned, they did not show any appreciably better results. In 6 of these 9 cases the results were favourable and in 3 the reverse. Of the favourable cases 3 were mild, 2 severe, and 1 moderately severe. In one of the favourable cases the response was satisfactory, and the basal metabolic rate and the pulse rate came down; but the patient said she felt no better and asked for operation, which was performed. In the three unfavourable cases, after lack of satisfactory response to the drug, operation was carried out. Mr. Joll hoped that treatment with thiouracil would be allowed only under strict control, and that manufacturers would not release these powerful and dangerous drugs to all and sundry.

General Discussion

Dr. E. P. SHARPEY-SCHAFER said that at Hammersmith Hospital about 30 cases had been treated and had done extremely well. It seemed likely that these substances might be beneficial in other conditions—for example, in very severe chronic congestive heart failure. There was some evidence of the action of thiouracil on the normal thyroid. While at the end of a week or ten days there might be no histological changes in the normal thyroid after 2 grammes a day, such changes might occur if the administration was continued, and he showed a photomicrograph of a biopsy section of normal thyroid which had had this dosage, and drew attention to the absence of colloid and the considerable increase in height of the epithelium. He suggested that the Medical Research Council might be asked

to collate and prepare a statistical analysis of the evidence concerning the dangers of these drugs and issue some advice on the subject.

Dr. HORACE EVANS said that he had had an opportunity of observing 12 cases at the London Hospital; in all of them the results were demonstrably satisfactory, and no serious ill effect had been produced; in one there was slight leucopenia. Dr. G. MELTON spoke of the effect on auricular fibrillation, and related the case of a woman, aged 65, with severe thyrotoxicosis, whose rhythm was restored to normal after about a fortnight on thiouracil—a result confirmed by the electrocardiograph.

Dr. S. LEVY SIMPSON said that although Prof. Himsworth's opening statement had a tinge of optimism, and Mr. Joll's an accent of scepticism, the results described by both were very much alike. There was no doubt that in a large proportion of cases thiouracil did lower the pulse rate and the basal metabolic rate to normal or below normal, and the patients increased in weight. The fact that it did not cure the exophthalmos was not unexpected. Surgeons stated that exophthalmos was not influenced by thyroidectomy. Nor need it be wondered at that the size of the thyroid gland sometimes increased under treatment. Apparently the drug prevented the synthesis of thyroxine, and therefore an increase, or at least an absence of decrease, in the size of the gland might be anticipated. He was convinced that thiouracil was a valuable and potent drug which, either in its present form or in some modified form, would find its place in therapeutics; but it was a potentially dangerous drug and at present should be used only by those who had specialized knowledge and were capable of observing their cases closely.

Prof. HIMSWORTH said that among the cases he had brought forward were a considerable number with secondary thyrotoxicosis, and he had no reason to suppose that they differed in their response to thiouracil from the primary cases. The decrease in the basal metabolic rate and the improvement in the clinical condition seemed to him exactly comparable in both sets of cases. If he might be allowed to criticize Mr. Joll's three "failures," it was not without significance that in every one of them iodine treatment had previously been given, and that two of them had been on thiouracil for three weeks and the third for four weeks, and then the administration had stopped; this in a patient who had been on iodine might be quite insufficient to show any effect on the pulse rate.

In an address on recent work on viruses at a meeting on June 2 of the Whipps Cross Hospital Medical Society Prof. S. P. BEDSON described the psittacosis group, their relation to other viruses of similar morphology, and the interesting finding that some cases of atypical pneumonia were due to the virus of the psittacosis group, and that the natural hosts of this disease included, in addition to birds of the parrot family, the fulmar petrel, the domestic fowl, pigeons, and possibly other bird species. He said that recent work had shown that herpes labialis in adults was the result of a carrier condition set up in infancy during an attack of herpetic stomatitis. Thereafter host and virus lived in equilibrium and herpes only appeared when some intercurrent trouble upset the balance. Discussing the mode of spread of poliomyelitis Prof. Bedson pointed out that the earlier and apparently convincing evidence incriminating the nasopharynx as the portal of entry was seriously questioned by recent American work, which demonstrated that the virus was excreted in the stools, infection being probably spread by food contaminated by hands or possibly by flies; the absence of explosive epidemics suggested that infection was not water-borne. The lecture was illustrated by lantern slides, and aroused much interest. It was announced at the meeting that the Society intended to invite outside practitioners to join who would be circularized as soon as rules for membership had been agreed on. Meetings will not be held during July and August.

At a recent meeting of the Maternity and Child Welfare Group of the Society of Medical Officers of Health Dr. DOYNE BELL gave an address entitled "A Reassessment of some Paediatric Procedures," in which he discussed, among other subjects, the indications for circumcision and for tonsillectomy; tongue-tie; the physiological variation in the period required for the establishment of lactation; the technique of breast-feeding; the treatment of breast abscess; and the management of constipation in the breast-fed baby. He also dealt with the use of sedatives for the "crying baby," the treatment of bronchitis in infancy; the advantages of national dried milk over patent foods; and the low value of ultra-violet light as a source of vitamin D.

Correspondence

Dietary Surveys

SIR,—The remarks by Miss E. M. Widdowson and Dr. R. A. McCance to the Nutrition Society, as reported in the *Journal* (June 10, p. 792), add point to a situation which may be described as follows.

If, ignoring the question of quality, there is, as is the case, complete ignorance of what constitutes an adequate amount of any one single nutrient substance; if the amount of these nutrient substances, as again is the case, varies in quantity in foodstuffs according to the locality of growth, manurial treatment, season, variety of plant, parts used, and other factors; if, as happens to be the case, the price of foodstuffs varies considerably from place to place and in the same place according to the social status of the purchaser; if, as is true, the point is not how much is *actually spent* on food but how much *could be spent* if it were not for the existence of ignorance and "luxury" spending, then it is difficult to see how anyone could say, as Orr and those who quote him do, that a certain proportion of the population is suffering from malnutrition because of lack of money wherewith to purchase an adequate diet.—I am, etc.,

Aberdeen. J. P. MCGOWAN.

Pulp Infection of the Fingers

SIR,—It is with the utmost satisfaction that I read the article on pulp infection of the fingers (June 10, p. 782), coming as it does from a member of the Forces. An inestimable amount of invalidism and permanent disability is caused by such infections, largely due to failure to appreciate the points enumerated by Major Denness. I would emphasize several additional facts in regard to treatment.

(1) The ethyl chloride spray has no part whatsoever to play in the treatment of pulp infections. This, in my opinion, has in the past been the largest single factor in producing disasters. It now has a strong rival in the sulphonamide group of drugs.

(2) Incision is most easily made and controlled while the finger is steadied and rendered avascular by a strip of gauze held tightly round the base of the finger.

(3) The U-shaped incision taken round the tip of the finger close to the end of the nail is not mutilating; in fact the scar is often invisible a few months after operation. This incision should be carried so far proximally that the flap can easily be turned through a right-angle; if this is done no indwelling "drain" is necessary, and very infrequent interference with the wound is required.

(4) Bandages should be dispensed with at the earliest opportunity, a gauze dressing and roomy finger-stall probably being the best means of allowing free movement; even this should be left off for periods during the day while the patient practises active movements of the terminal interphalangeal joint with the middle phalanx held steady.

Only a primary subperiosteal infection or delay on the part of the patient in seeking advice can excuse bone necrosis. In every other case it is the practitioner or surgeon who is culpable and who should seek guidance in the hard school of self-criticism rather than in pondering whether he gave the proper dose of the proper sulphonamide!—I am, etc.,

Weymouth. D. J. ROSS STEEN, F.R.C.S.

SIR,—The paper on treatment of pulp infection of the fingers in the field by Major T. Denness is of much interest, while it should be found of great value to all who have to deal with these important infections.

There are three points, however, that warrant further discussion.

(1) Major Denness advocates the use of bilateral incisions of the pulp; I have used a unilateral incision, as described by C. L. Callander in his textbook on *Surgical Anatomy* (W. B. Saunders Company, 1939), for a large number of these infections with success. The knife is introduced into the lateral aspect of the pulp so that the tip of the knife can be felt just under the skin on the opposite side, and the incision is then made so that the whole of the pulp space is opened to allow adequate drainage; sinus forceps may be used to ensure that this is so. While on this point I would reiterate

Major Denness's remark that the incision need not be carried across the finger-tip, and I would add that it should never be, since it may result in loss of tactile sensation of the finger-tip, a notable prolongation in the time needed for healing, and often an ugly deformity of the finger.

(2) A corrugated rubber drain can still be used with the unilateral incision, although I have found that ribbon gauze soaked in a 50% solution of magnesium sulphate containing 10% glycerin is far superior, while it can be changed daily until pus is no longer present.

(3) Morphine seems to be quite out of place in the post-operative treatment, since, if the incision is adequate, the tension in the pulp space is relieved and the patient should be free from pain, and will sleep well with the help (if help be needed) of aspirin gr. x and barbitonum soluble *B.P.* gr. v on the first night, while he will sleep naturally on the following nights.

The need for prompt and thorough treatment is great, and, as Major Denness so rightly points out, "a man may be off duty longer with a whitlow than after appendicectomy"; that "conservative methods are unavailing" cannot be over-emphasized. In a recent latter (Feb. 5, p. 198) I showed that in pulp infections treated early the average healing time is 8.5 days, while delay can lead to a period as long as 26 days before healing takes place, and the resultant stiff finger is a cause of a further number of weeks' disability, which has its effect just as much in the factory as on the battlefield.—I am, etc.,

Surbiton Hospital. PHILIP HOPKINS.

Volkmann's Ischaemic Contracture

SIR,—The article by Mr. G. A. Pollock (June 10, p. 783) is extremely opportune, as the question of ischaemia in general is worthy of the fullest consideration.

The statement from a textbook on orthopaedic surgery which is quoted by Mr. Pollock is one with which most will agree: but the question of early surgery must surely be for the ischaemia and not for the established deformity.

I was tempted to conclude from Mr. Pollock's article that he was not in agreement with the widely established view that ischaemic contracture is caused by arterial vasospasm. In a recent article on ischaemia I tried to collect the clinical and experimental evidence and show that vasospasm most commonly results from afferent impulses arising within the arteries themselves. Thus vasospasm may be limited to section of the artery above and below the site of origin of the afferent impulses, or it may involve the distal part of the artery completely. In the case of the radial and ulnar arteries one can be involved without the other. Thus, although the anastomosis between the radial and ulnar arteries is excellent, a vasospasm in either will seriously affect any structures which are supplied entirely or even almost entirely by that section of the artery in spasm. For example, I saw a man recently who was alleged to be the subject of Buerger's disease. He had already had a bilateral lumbar ganglionectomy; now the upper limbs were affected. One index finger was gangrenous at the tip and the condition seemed to be progressing. This was in spite of a good strong ulnar pulse, the radial being absent.

Wounds of large arteries by shell fragments, etc., are commonly associated with local vasospasm for which excision seems to be the best treatment. Thus it is, in spite of the seriousness of the injury, *very little haemorrhage occurs.* Unless these wounds are explored the vasospasm may be missed and in consequence gangrene or ischaemic contracture may result.

Adverting to the case described by Mr. Pollock, the history strongly suggests that the ulnar artery, as the result of trauma, became the site of a local vasospasm. No massive contracture would develop as the radial artery was intact. It would be interesting to know if there was an ulnar pulse at the time of examination, as the presence of a radial one does not affect the issue and, somewhat paradoxically, neither does the presence of an ulnar pulse, as the artery may be in spasm only to a limited extent. Even so the amplitude of the ulnar pulse might be much less than the radial.

The case history described by Mr. Pollock indicates a complete lack of infection. Thus a secondary haemorrhage on the twelfth day would seem unlikely unless the "secondary haemorrhage" were due to relaxation of a vasospasm. The small disability caused in this case seems most likely to be due to the extremely limited area of muscle affected by the lack of ulnar blood supply. The somewhat late operation for a Volkmann (20 days after injury) was probably timely enough, in that gross changes resulting from ischaemia had not yet occurred or could not occur.

This letter is not intended in any way as a criticism of Mr. Pollock's article. It is merely a different approach to the matter in the interests of discussion. When one is faced with making the decision whether to explore a wound or not it requires considerable thought and may be luck to be right in every case. Most surgeons would have followed Mr. Pollock exactly up to Dec. 24; I doubt if most would have decided to explore at that time under the circumstances, though the end-result proved the wisdom of so doing.—I am, etc.,

Wembley. J. SHIRLEY CALLCUTT.

Cerebral Malaria

SIR,—I have read with interest the article by Dr. I. B. Sneddon in the *Journal* of Dec. 25, 1943, regarding the above, and also the letter on the same subject by Drs. G. B. Young and C. J. A. Macaden published on May 13 of this year. It seems to me unfortunate that so much emphasis is placed on the more severe types of cerebral infection—maniacal excitement, coma, etc. In my own experience as a neuropsychiatrist it was the milder types that were the more frequent and which occasioned the greater problem. For example, it was not uncommon to meet with a soldier who was accused of being drunk and disorderly suffering from cerebral malaria, or another absenting himself from his unit and found wandering. Further, many cases of sudden impulsive violence met with in the Far East I have demonstrated as being caused by a quartan cerebral infection. Neglect to recognize these cases is most unfortunate to all concerned.

With regard to the immediate treatment of severe cerebral malaria, I am of the opinion that local experience should always be consulted. In hospitals receiving patients from over a wide area it is wise to chart out the different schemes for reference, as the results obtained are vastly superior to any dogmatic plan. With this information available I have frequently given 10 gr. of quinine intravenously with excellent results. Where no experience was to hand 3 gr. of quinine well diluted and given very slowly should be tried, and, if no improvement takes place and no intolerance is noted, repeated in two hours.

In special practice one receives cases from many practitioners, and it may be that I have obtained an unfortunate concept of the incidence of quinine abscess as being by no means rare. When one recollects the amount of crippling and tissue destruction occasioned by a quinine abscess I am most reluctant to commend the intramuscular method to anybody.

In conclusion, I am of the opinion that it is wise to prescribe a course of psychotherapy in all cases of cerebral malaria, mild or severe. I believe, if this course was adopted, a large number of the dreadful tragedies which are not an uncommon sequel would be obviated.—I am, etc.,

Walkden, Lancashire. D. FENTON-RUSSELL.

Chemotherapy in Otitis Media

SIR,—It is most desirable that attention should be directed, as in Mr. Dingley's paper in your issue of June 3, to the dangers of sulphonamide therapy in acute otitis media, but I think he goes too far when he says, "The wholesale use of sulphonamides in otitic infections is to be deprecated." Mr. Dingley's antisulphonamide views are those of an otologist, but, after all, the real authority on the value of chemotherapy in early acute otitis is not the otologist but the general practitioner; he sees the cases which get better, the otologist as a rule only sees the ones which don't. Before sulphonamides were introduced my wife developed acute otitis, and I got a colleague to do a myringotomy; after their introduction my son was similarly afflicted, and I called in a good general practitioner as likely to know more about the behaviour of inflamed drums in the early stages under sulphapyridine.

My friends in general practice all say that the great majority of acute ears subside quickly and completely with sulphonamides. But, apart from evidence of frank mastoiditis, if

all the signs of simple acute otitis (whether the drum bursts or not) have not completely subsided in 10 to 14 days under adequate chemotherapy (and this for an adult means not less than 1 g. 4-hourly and not one tablet t.d.s., as one still sometimes finds given), an otologist ought to be called in at once. Under these circumstances the persistence of a profuse discharge alone is strong evidence that the mastoid is infected, and the persistence of any discharge at all a warning to be on the lookout for trouble.

My own experience of mastoid operations is that before the days of sulphonamides one encountered many more mastoids, but of these a very small percentage had complications; nowadays I do a fraction of the pre-war number of mastoids, but among them an enormously higher proportion come up with complications such as intracranial infection, sinus thrombosis, and septicaemia. The reason is, as Mr. Dingley points out, that if the infection is not eradicated but merely suppressed it grumbles away silently in the mastoid till it gives rise to serious trouble. As regards myringotomy, I have almost packed away my myringotome: first, because I do not see the acute ears, since the general practitioners cure them; and, secondly, because I have been disappointed with the results of myringotomy in conjunction with sulphonamides—instead of the expected gush of pus I have often felt that I have only incised an oedematous drum and not really done any good.

Perhaps Mr. Dingley would say that if I got at the ears earlier and incised them without chemotherapy I wouldn't see so many complicated mastoids. I think the answer to that is that what is at fault is the non-realization of the damping-down effect of sulphonamides, particularly in insufficient dosage, and that to discourage general practitioners from using chemotherapy for acute otitis would do far more harm than good.—I am, etc.,

Guildford. G. H. STEELE.

Chemoprophylaxis of Gonorrhoea

SIR,—In your review of Dr. Herrold's book (June 3, p. 753) you state: "Apparently prophylaxis not only for Service men but for civilians is recommended; a warning is wisely uttered against the use of oral sulphonamides for this purpose." The last clause does not accurately represent Dr. Herrold's views. On page 91 of his book he says:

"This method of prophylaxis is not without danger because the incidence of patients previously sensitized to sulfonamides is likely to increase as time goes on. Such prophylaxis, therefore, is more safely given in close co-operation with a physician. Should oral chemotherapy prove efficacious, additional prophylaxis should be given for the prevention of syphilis. From a practical view, therefore, the exposed individual should report for both measures of prevention and should not be given a quantity of the particular sulfonamide as a precautionary measure to be taken before or at the time of exposure."

Self-medication by sulphonamides is to be deprecated, but medical practitioners should not be dissuaded from prescribing, on the day following exposure, a method of prophylaxis of proved efficacy—e.g., three doses at four-hourly intervals of sulphathiazole or sulphadiazine, 3 g., 2 g., and 1 g. It should be added that in individuals whose work calls for a high degree of visual and mental efficiency such use of these drugs is inadvisable.—I am, etc.,

May and Baker, Ltd., Dagenham, Essex. ROBERT FORGAN.

SIR,—I am interested to see your article (May 20, p. 695) on sulphonamide prophylaxis of gonorrhoea. The question of prophylaxis for this disabling disease is of prime importance, but I feel that one important observation has been omitted from the article which would prevent me from using it in the manner described, unless my views on the matter undergo a radical change in the light of the opinion of experts.

My objection is this: the administration of sulphathiazole prophylactically carries with it the danger that by its very administration we may hide those symptoms which are sometimes the only indication of the presence of the disease, a disease which a man is usually most anxious to hide, and which, in the absence of symptoms, he may not report at all. If sulphonamide is given prophylactically it is at the best a very "hit-and-miss" method, and cannot be subjected to critical analysis or results accurately assessed. I feel that if a man has had prophylactic treatment it is very difficult to state whether he has (*a*) had the disease and been cured (a deduction which can only be made from the man's own statement), (*b*) has not been infected at all, (*c*) has got a latent form of infection without any external symptoms. In addition to this, it is surely axiomatic that wherever possible a patient should be allowed to develop his own immunity before calling in the aid of drugs.

I am not a venereologist and probably the factors I have mentioned can be satisfactorily answered by one with greater knowledge than myself, but at present I would be chary of introducing a form of preventive treatment over which I felt that I had little or no control, and the results of which I was unable to check with any degree of accuracy.—I am, etc.,

KENNETH G. BERGIN, M.B., B.CH.,
Squad. Ldr., R.A.F.

Expectation of Life in Urinary Tuberculosis

SIR,—The case reported by Mr. Victor Bonney in your issue of May 20 illustrates the fact that Nature can effect what is to all intents and purposes a complete cure of tuberculous lesions of the urinary tract. Further examples are provided by two cases I saw some years ago.

1. *X*-ray examination of a lady aged 80 after an injury to her back revealed the fact that the right kidney and ureter were completely calcified. She informed me that she had had severe frequency, dysuria, and haematuria at the age of 20. These symptoms persisted for several years, then gradually disappeared. She has remained in good health since that time and has had no return of urinary symptoms.

2. A well-nourished and very active man of 60 who has attended St. Peter's Hospital for a number of years for dilatation of urethral stricture mentioned that he had been treated for urinary tuberculosis at the age of 15. His symptoms subsided after several years and he has remained in good health. Investigation showed that he had a completely functionless calcified left kidney. The left ureteric orifice was obliterated and retracted. The urine was normal.

In both these cases cure was effected by complete destruction of renal parenchyma with extensive fibrosis and calcification of the remaining peripheral renal tissue and fibrous obliteration of the ureter (so called "auto-nephrectomy"). It is obvious that a process such as this can only go on to completion when the lesion is a unilateral one, and it seems likely that in Mr. Victor Bonney's case destruction was confined to one kidney, tubercle bacilli being regurgitated from an infected bladder along the ureter of the normal side, and thus appearing in both ureteric catheter specimens. It should be pointed out, however, that spontaneous cure is the exception rather than the rule, and that there is overwhelming evidence to indicate that nephrectomy is the treatment of choice in any unilateral destructive tuberculous lesion of the kidney. In such cases surgery effects a complete and rapid removal of a progressive and (for all practical purposes) localized tuberculous focus. Nature's cure is, on the other hand, prolonged and may remain incomplete for a number of years; meanwhile the patient is exposed to the risks of spread of the infection, particularly in the direction of the opposite kidney.

The conclusion is that nephrectomy, in suitable cases of urinary tuberculosis, will on the whole increase the expectation of life, though it must be admitted that spontaneous cure will occur in a small proportion of cases not treated surgically.—I am, etc.,

JOHN SANDREY,
Temp. Surg. Capt., R.N.V.R.

Aerial Convection from Smallpox Hospitals

SIR,—Allow me to supplement my last letter by referring to the three letters appearing in the *Journal* of June 10.

As regards Sir Alexander Macgregor, we in Leicester also adopted the procedure he describes, and used not to allow members of the staff of the smallpox hospital (other than the medical officer) to go outside. After a certain spell of duty they were given long leave after thorough disinfection, and they were also paid extra salary. I am quite satisfied that "hospital operations"—apart from aerial convection—could not conceivably have accounted for the sudden and remarkable outbreak referred to in my previous letter.

As regards Dr. John Ware and his reference to the Purfleet experience, I certainly cannot agree with him that the bottom

is knocked out of Sir George Buchanan's report because a solitary member of the staff at the hospital ships was discovered to have visited his sweetheart in Purfleet. In any case I only adduced the Purfleet experience as "strong confirmation" of the convection theory. I am glad to learn that Dr. C. J. McSweeney is one of those who have not lost faith in the theory.

Allow me to add a word of explanation to my original article. When I said that out of nineteen members who took part in the Epidemiological Society's debate seven were against the theory of aerial convection, I was including those (and they were the majority) who only said that they were not yet convinced and desired further confirmation. As Prof. Ralph Picken has shown in his letter, some confirmatory evidence has since been forthcoming, and I suggest that, but for the fact that there has been so little epidemic major smallpox in this country during the past 40 years, much more confirmatory evidence might have been forthcoming.—I am, etc.,

Leicester. C. KILLICK MILLARD.

Progesterone

SIR,—I would like to make a few observations on a letter from Dr. Walter Calvert (June 3, p. 772) on vomiting of pregnancy. In it he states: "I believe and teach that many of the physiological and minor pathological phenomena of pregnancy are due to the high blood level of progesterone." He then goes on to point out that progesterone relaxes plain muscle, and so produces uterine relaxation, constipation, low blood pressure, varices, and also vomiting. Acting on this assumption he has given stilboestrol in 1-mg. doses three times daily for three days with apparently good results.

In the past I have made various personal communications to Dr. Calvert, and am prompted to ask whether his views may not be based on the opinions therein expressed. If that is the case, I wish to make it quite plain that the originator of this theory, so far as I know, is Mr. Barton Gilbert, F.R.C.S., who is at present in Southern Rhodesia, and is thus unable to speak for himself. Before the war I had the good fortune to live with Mr. Gilbert for nearly a year, and during that time he propounded his theory in full so far as he had at that time worked it out. In short it was as follows: In some pregnancies the corpus luteum is more active than in others, and in some it may even be overactive. In the latter case there is an excessive amount of progesterone circulating in the blood stream, and it acts as a general relaxer of smooth muscle throughout the body. Let us consider the effects of this relaxation in further detail.

1. *The Blood Vessels.*—When the patient is in bed at night blood tends to "pool" in the dorsal region, and if the patient rises hurriedly in the morning, the column of blood at once falls to the lower extremities, producing a sudden cerebral anaemia. The patient at once tries to compensate for this by taking big breaths, in order to suck blood upwards through the action of the diaphragm. As the stomach sphincters are at the same time in a state of relaxation, and as the stomach is empty, this results in regurgitation of only a small amount of mucus into the oesophagus. Hence early morning sickness. In favour of this general relaxation of the blood vessels is the fact that slow rising in the morning is in many cases effective in combating early morning sickness. Another piece of confirmatory evidence is that transient "blackouts" are also common in pregnancy.

2. *The Intestinal Tract.*—This is generally relaxed in the early months particularly, with resulting constipation, piles, dyspepsia, and so on. I have personally had quite remarkable success in some cases of severe constipation of pregnancy by giving hexoestrol up to 10 mg. daily. I have never seen any ill effects, and have always kept a very careful watch on the blood pressure during its administration, as was suggested to me by Mr. Gilbert as long ago as 1938. As he then pointed out, the therapeutic effects of giving oestrin can be gauged by the rise in blood pressure that follows, and provided that the systolic pressure does not rise above 115 there will be no untoward effects.

3. *The Leg Veins.*—Relaxation in this situation naturally favours varices. The usual explanation is that there is "pressure" on the veins, yet in large abdominal swellings, such as fibroids and ovarian cysts, varices are not by any means the rule. Gilbert's view was that the circulating progesterone was the causative factor in the production of varices.

4. *The Veins of the Vulva.*—Similarly here too vulval varices were, he thought, due to the effects of progesterone.

5. *The Viscera in General.*—Here, as elsewhere, his theory postulates relaxation of the blood vessels supplying the part. The effect is particularly notable in the kidneys. During the early weeks when the corpus luteum is still active the kidney blood vessels may become progressively dilated, and thus stagnation of the circulation occurs. As a result the rate of blood flow becomes slower, and the effect is that the vessels, already dilated, become more and more full of blood. Finally thrombosis or haemorrhage will occur. This is of course, very roughly, the pathology of the kidney changes in eclampsia. According to Gilbert's theory, the harm in toxaemias of pregnancy is done in the early months by the continued relaxation of the kidney vessels, and thus when the disease becomes obvious in the later weeks, by the appearance of albumin in the urine and a rise in blood pressure, it is virtually untreatable except by symptomatic measures. Logically the blood pressure could be lowered by giving more progesterone, but as this is already in excess the condition would merely be aggravated by such treatment. Again, oestrogens could be given to negative the effect of the circulating progesterone, but as oestrogens raise the blood pressure this too is illogical. The rise of blood pressure was in his view merely an indication that an attempt was being made to compensate for the kidney insufficiency, as shown by the presence of albuminuria. He felt that if only some simple means could be elaborated of estimating in the out-patient department the level of the circulating progesterone in the early months, it might be possible to treat toxaemias logically instead of empirically from the outset of the disease. Unfortunately the advent of the war cut short any further investigations along these lines.

6. *The Uterus.*—Relaxation of the uterus, with primary uterine atony, was in his view due to the same cause, and this he felt was borne out by the fact that toxaemic patients are on the whole more prone to this condition.

7. *The Placental Site.*—Continued dilatation of the vessels of the placental site favours retroplacental bleeding and the occurrence of accidental haemorrhage.

8. *The Urinary Tract.*—Relaxation of the smooth muscle in this situation favours urinary stasis, ascending infections, and thus the occurrence of pyelitis of pregnancy.

With reference once again to Dr. Calvert's letter, I too have had very good results with hexoestrol in early morning sickness and also in constipation of pregnancy, but I cannot say that the results have been uniformly good. I have on the whole given larger doses—up to 10 mg. daily—with no ill effects. Another condition that I have found will sometimes respond well is depression and loss of energy in the early months, but only if this is associated with a very low blood pressure, with systolic readings of 80 to 90.

In conclusion I would stress once again that so far as I know the whole of the theory outlined above was worked out by Gilbert as early as 1938.—I am, etc.,

London, W.1. D. G. WILSON CLYNE, F.R.C.S., M.R.C.O.G.

Fractured Carpal Scaphoid

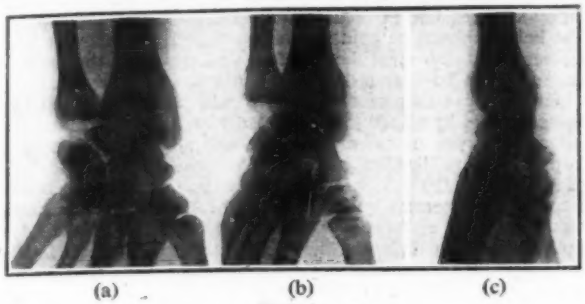
SIR,—I was much interested in the article on fracture of the carpal scaphoid by Jeffrey M. Robertson and R. D. Wilkins in the *Journal* of May 20. Having sustained fracture of the right scaphoid myself in 1940, there are many points in their article which apply to my own case and which I feel will not be out of place if they are reiterated.

I agree whole-heartedly with Robertson and Wilkins in stressing the importance of having all sprains *x*-rayed. In my own case I did not at first believe that I was suffering from anything more than a sprain of the wrist. The accident I had resulted from cranking up my car, which back-fired. I suffered some pain in the wrist which was not severe enough to prevent me from driving to the hospital that morning, and carrying out an operation list. My wrist felt very tired at the end of the morning's work, and I decided that an *x*-ray would be advisable. To my surprise, a small crack was visible in the scaphoid (Fig. 1b). This crack was not in the usual situation for a fracture to occur—that is, in the waist of the bone. This *x*-ray plate further brings out points as remarked in the article of Robertson and Wilkins—namely, the importance of taking exposure in different planes. It will be seen that in Fig. 1 no fracture is seen in position 1a and 1c, but shows up distinctly in position 1b.

Again, the authors remark on the extreme difficulty in demonstrating a fracture, in many cases, in the early stages. This is shown in my own case, as seen in Fig. 2. This was taken 20 days after the original *x*-ray, and it will be seen that a line of rarefaction is now beginning in the waist of the

scaphoid. Between the taking of the first radiograph on Aug. 20, 1940 (Fig. 1), and the one on Sept. 10, 1940 (Fig. 2), a radiograph was taken, but this showed no fracture in the waist, although the fissure was still present in the distal part of the bone.

I am of the opinion that in many cases of "sprained wrists" a great deal of later disability can be avoided if the precaution is taken of applying a plaster-of-Paris immobilization even in



(a) (b) (c)

FIG. 1

FIG. 2

those cases where *x*-ray examination is negative. In such cases, furthermore, it is important that radiographs be taken so as not to miss a delayed fracture which has developed owing to osteoporosis as in my own wrist.

I am much indebted to my former colleague, Mr. J. Hindenach, F.R.C.S., who treated my wrist in such an excellent manner, and to Dr. W. H. Caldwell for his radiological skill.—I am, etc.,

Slough Emergency Hospital. MAURICE LEE.

Why Tie the Cord?

SIR,—I read with much interest Dr. E. W. Price's letter (June 3, p. 772), for much other evidence supports the view that ligation of the cord is normally unnecessary. This evidence has been reviewed in a book on the foetal circulation, etc., written by Dr. A. E. Barclay, Miss M. M. L. Prichard, and myself, and shortly to be published by Messrs. Blackwell Scientific Publications Ltd., Oxford. The most striking single contribution is that of A. N. Rachmanow (*Zbl. Gynäk.*, 1914, **38,** 590), who was convinced by the structure of the cord vessels in man and lower animals that ligation was unnecessary, and thereafter proceeded to demonstrate the fact in several thousand confinements in a State maternity hospital in Moscow. My co-authors and I are not obstetricians, but the general trend of the evidence is such that we felt bound to conclude with the sentence: "One's only surprise is that a procedure, so firmly based upon the physiological properties of the cord vessels, has not been more universally adopted."—I am, etc.,

Oxford. K. J. FRANKLIN.

Medical Education

SIR,—I surmise that it is as the representative of "the practical man" that Dr. W. E. Hick (June 10, p. 796) has felt impelled to reply to my letter, and I do not dispute that there is an aspect of truth in his letter. Unfortunately, it does not contain the whole truth about the problems of medical education. It is that familiar fragment of the truth that we are never allowed to forget and that has done so much in the past to make medical education what we now deplore it to be. In the hope of making every new doctor the complete craftsman, we have overloaded the student with techniques and with masses of uncoordinated information. We have made him look on—under conditions rendering useful observation almost impossible—at complicated surgical operations that, as a general practitioner, he will never be called upon to perform. We have inflicted no fewer than six lectures on smallpox vaccination upon him, and a vast deal of other wholly unpractical "practical" tasks. All this at the behest of generations of "practical men." We have made the cultivation of a reflective mind virtually impossible for him, and now seek to palliate our folly by maintaining that, after all, reflective minds are rare and most men prefer to occupy themselves with techniques.

Let us agree that the practising doctor should, in his proper field, be a competent craftsman, but must we confine him to this role? The pure craftsman does not add to knowledge; he simply practises and transmits what he has been taught. Is this all we ask of the doctor and of a medical education? Hitherto we have prided ourselves as forming a learned profession. Do we wish so to continue, or are we in future to be content—with Dr. Hick—to accept the motor mechanic as our exemplar and ideal? If, as I believe is the case, we do wish to remain a learned profession, then we must accept the intellectual responsibilities and privileges involved, and bear the burden of some learning over and above our bedside and laboratory techniques. We have no right to ask for a university degree on a purely polytechnic type of knowledge, and, like undergraduates in other university faculties, we must be prepared to examine the foundations of our science and to acquaint ourselves with its general principles. The university student of physics, even if he intends ultimately to be an electrical engineer, is expected to know the foundations of physics. This knowledge does not render him less efficient as an engineer, and will probably prove the basis of any additions to knowledge he may himself make.

Are we to suppose that medicine differs in these respects from other scientific disciplines, that the medical student is less willing than his fellows to think about his subject or that he is incompetent to do so? That he has not time for thought is an objection it is now sought to remove from his path, and if we can release the stranglehold of the "practical man" from his education and systematize his training there will be no difficulty in doing so. There are few students who would not be the better for at least a leaven of theoretical education, even if this did involve some small contact with metaphysics, of which I have not the superstitious dread shared by your correspondents.—I am, etc.,

London, W.1. F. M. R. WALSHE.

Character and Personality in the Medical Student

SIR,—I am instructed by the Committee of the St. Mary's Hospital Students' Union to write with reference to certain allegations made against the modern medical student in your columns (May 27, p. 729). Dr. E. D. Broster asks: "How can it be wondered at if the medical schools are crowded with men with brains but no character, with precepts but no principles? Decent living, refinement of speech and of conduct, love of poetry or the arts of good conversation, of wisdom, of learning—all these have been at a discount and have even been scoffed at in the physical and mental squalor of the years between the wars." In the majority of the great medical schools to-day there exist thriving societies for the advancement and study of these very arts and refinements. To name but a few: there are the medical societies, where many and varied subjects are lectured on and discussed; dramatic societies, where good plays are read and acted and dramatic art and literature considered in many of its aspects; musical societies, where great musicians of our time come to play and discuss good music. Furthermore—and this is important—in most schools these societies have arisen as an expression of a spontaneous desire of the students themselves.

How can it be said, then, that a love of these arts and of the good conversation that is part of them does not exist? And who would deny that character and principles and decent living are born or kept alive by the British love of sport, so well seen in the medical schools to-day? In the future these activities may well be extended and widened in their scope and receive a greater measure of official encouragement, in order that the students' general education may profit thereby; but to deny that these things exist at the present is surely idle.—I am, etc.,

DONALD BROWN,
Hon. Sec., St. Mary's Hospital Students' Union, W.2.

Obituary

JUDSON S. BURY, M.D., F.R.C.P.

Dr. Judson Bury, consulting physician to the Manchester Royal Infirmary, died at Chinley, Derbyshire, on June 10, aged 92. He had long retired from active practice, but was president of the Section of Neurology and Psychological Medicine at the Annual Meeting of the B.M.A. in Manchester in 1929.

Judson Sykes Bury was born at Salford the son of Peter Bury. He was educated at Amersham Hall, Reading, at Owens College, Manchester, and at University College Hospital, London. In 1877 he took the M.R.C.S. and the M.B., B.S. of London University, proceeding M.D. two years later, after holding resident posts at U.C.H. He then returned to Manchester, where, after a year as senior resident medical officer at the Children's Hospital, Pendlebury, he engaged in general practice and began his long connexion with the Royal Infirmary as non-resident medical registrar in 1885. He became assistant honorary physician in 1899, and remained on the active staff of the Royal Infirmary till 1912, when he reached the age limit. He was a very good teacher, clear and precise, but best on neurological subjects, and he wrote with an excellently lucid pen. He was well read in general literature, and introduced such knowledge with interesting effect into his professional papers. In 1893 he published a *Treatise on Peripheral Neuritis*, comprising a series of observations by James Ross, which Ross had intended to print as a complete monograph. On Ross's death, at the age of 55 it was left to Bury to carry out the intention as fully as he could. The first half of the book was written from views expressed by word of mouth to him by Ross; but the rest was his own except the section on diabetic neuritis written by R. T. Williamson. Judson Bury also published in 1894 *Clinical Medicine*, a manual for the use of students and junior practitioners; it met with a good response and a third edition appeared in 1912, written jointly with Albert Ramsbottom, his junior colleague at the Manchester Royal Infirmary. In his *Diseases of the Nervous System* (1912) Bury adopted a clinical classification which he had found the most useful to the student. His method was to give a description of the chief neuronic systems, and then illustrate the various forms of paralysis and other nervous symptoms in relation to lesions of the corresponding neurons. He also wrote an article on peripheral neuritis in 1899 for *Allbutt's System of Medicine*. An interesting section of that article is the reference to the epidemic of neuritis caused by arsenical impurity in the beer supplied in the Manchester and Salford districts by a firm of brewers, the cause of which was discovered by E. S. Reynolds.

Judson Bury was elected a Fellow of the Royal College of Physicians of London in 1894 and delivered the Bradshaw Lecture before it in 1901, his subject being "Diagnosis in Relation to Disorders of the Nervous System." He examined in medicine for the College in 1911–15. He took his full share of honours in local scientific work, being president in turn of the Pathological Society and the Medical Society of Manchester, and of the Association of Physicians when it met in that city. He was professor of clinical medicine in Manchester University in 1911–12, and he edited the *Manchester Medical Chronicle* from those years until the disturbances caused by the last war ended its career. During 1914–18 he served with the rank of major, R.A.M.C., and did good work on medical boards in Manchester and Warrington.

Four years ago his friends and colleagues presented him with a book containing selected addresses and papers by him printed in Manchester between 1896 and 1939. Judson Bury bore his octogenarian years very well, never looking his age, his hair and beard scarcely silvering. He was a golfer and had been president of the local medical golf society.

GEORGE WAUGH SCOTT, O.B.E., M.D.

George Waugh Scott was taken ill at the cottage of one of his country patients on June 6; he died a few hours later at his home in Malvern Links at the age of 61. After qualifying at Glasgow University in 1907 and serving as senior house-surgeon at Greenock Infirmary he became medical officer to the Kamuning, Heawood, Changhat Salak, and Other Estates Hospitals Association, spending the bulk of his professional life in medical practice in Malaya, where his interests were particularly related to tropical medicine and epidemiology.

Since he came to Malvern in 1937 (writes a colleague) he has never rested on his oars; the outbreak of war saw him anxious to help his country, and he offered his services for the East again or wherever they might be required. He was asked to get the Malvern first-aid post going in 1939, and one of the most efficient posts with a happy staff resulted in record time. He made but one stipulation—that he should not be paid for this work; all his staff were unpaid volunteers and he must be treated similarly. In the brief but strenuous years he had resided in Worcestershire the character of the man "always to give of his best" was soon recognized by his patients, so that he gained their confidence and affection in a remarkable way. He was deservedly popular with all practitioners because he was always willing to help in any way and was a delightful companion. At the time of his death he was chairman-elect of the Worcester and Bromsgrove Division of the B.M.A., and in previous years had served on the council and as president of the Malaya Branch. He was a Fellow of the Royal Society of Tropical Medicine and the first president of the Vigornian Clinical Society. He showed that it was possible for one busy in general practice to keep abreast of the times, and to participate actively in hospital clinical meetings. These he seldom missed, nor did he fail to promote in them a lively discussion and an atmosphere of friendliness. He carried his Scottish individuality with him and radiated charm. More than one person had been heard to say that his companionship would go far to mitigate the disadvantage of life in the Far East. He is survived by his wife and his son Gavin, who continues in the practice.

T. S. M. writes: Waugh Scott will be mourned by many friends in this country, and by others in the Changi Concentration Camp at Singapore. He was truly a pioneer, and worked in Malaya from 1908 to 1936. His first tour of service was spent on a "jungle-locked" tin mine, in medical charge of some thousands of Asiatics, with only river and sea communications to Singapore. Later he settled in Perah, and became the medical officer for many rubber estates, certain public works, besides engaging in private practice. He was a sound general practitioner, and also an expert in the prevention of malaria and other tropical conditions. Many a poor Asiatic blesses his name, the wealthy companies appreciated his services and advice, and the Government acknowledged his welfare and public work by granting him the O.B.E. During a busy medical career he engaged in many aspects of public life, was a good churchman, president of the local B.M.A. and a member of most central medical and welfare bodies. In public he was a clear, thoughtful, and fearless speaker not always to his own advantage.

The Services

Surg. Cmdr. G. M. Tanner and Surg. Lieut.-Cmdr. H. E. Holling, R.N.V.R., have been awarded the R.N.V.R. Officers' Decoration.

Col. (Temp. Brig.) E. A. Sutton, C.B.E., M.C., late R.A.M.C., to be a D.M.S., with the acting rank of Major-Gen.

Wing Cmdr. C. A. Rumball, R.A.F., was appointed O.B.E. (Military Division) in the Birthday Honours List published on June 8. This name was omitted from the list of medical honours published in the *Journal* of June 17 (p. 823).

Acting Wing Cmdr. C. C. Barker, R.A.F., has been awarded the A.F.C.

Fl. Lieut. G. D. Graham, M.B.E., R.A.F.V.R., has been awarded the D.S.O. in recognition of distinguished services in air operations.

CASUALTIES IN THE MEDICAL SERVICES

Wounded.—War Subs. Capt. C. Cronin and A. D. Parsons, M.C., R.A.M.C.

Killed.—Major T. P. Ward, R.A.M.C.

Died.—Major V. H. Sarland, R.A.M.C.; War Subs. Capt. C. W. Williams, R.A.M.C.

DEATHS IN THE SERVICES

Col. EDWIN THOMAS FAIRWEATHER BIRRELL, C.B., C.M.G., died on May 29 at Penicuik, Midlothian, at the age of 80. He was educated at Trinity College, Glenalmond, and Edinburgh University, where he graduated with the M.B. in 1895. He entered the Army Medical Service in the following year and reached the rank of colonel in 1917. During the Balkan war of 1912–13 he served as British Red Cross Society Commissioner for Bulgaria and received several foreign orders. During the war of 1914–18 he served at the headquarters of the British Expeditionary Force, and later with the British Salonika Force and with the British Military Mission to South Russia. He received the C.M.G. in 1915 and the C.B. in 1917. He retired in 1923 and was recently serving in the Home Guard.

Universities and Colleges

UNIVERSITY OF SHEFFIELD

On the recommendation of Senate the Council of the University has elected Mr. R. St. Leger Brockman, M.Chir., F.R.C.S., to the chair of surgery. Prof. Brockman served from 1914 to 1919 as a surgeon in the Royal Navy, after an undergraduate course of distinction at Cambridge and St. Bartholomew's Hospital. After the war he first went to Sheffield as a resident surgical officer at the Royal Infirmary; then followed a period in London as chief assistant at Bart's; after which he returned to Sheffield, where he has been an honorary surgeon at the Royal Infirmary, consultant to the City General Hospital, and lecturer at the University.

ROYAL COLLEGE OF PHYSICIANS OF IRELAND

At a meeting of the President and Fellows of the Royal College of Physicians of Ireland held on June 2 the following were admitted:

As Fellows: Agnes Savill (*in absentia*), S. Simms, C. F. McConn, R. C. Sutton (*in absentia*), T. D. O'C. Donelan, E. B. McEntee, J. G. Gallagher, and W. J. E. Jessop.

As Members: M. J. O'Malley and M. D. Hickey.

ROYAL COLLEGE OF SURGEONS IN IRELAND

BOXWELL MEMORIAL

The teaching staff of the Schools of Surgery, Royal College of Surgeons in Ireland, has decided to institute a memorial to the late Prof. William Boxwell, who occupied the chair of pathology from 1916 to 1943. All Fellows and Licentiates of the College, and all other medical or non-medical persons who wish to associate themselves with this effort, are asked to subscribe to the memorial fund which is being formed. The fund will be devoted to providing some additions to the Department of Pathology which will further the study of that subject, and it is hoped that the appeal will meet with a generous response. Subscriptions should be sent to Prof. W. N. Rae, ScD., Registrar, Royal College of Surgeons in Ireland, Stephen's Green, Dublin.

Medical Notes in Parliament

Opium for Straits Settlements

During the debate on colonial administration on June 6 Mr. W. W. ASTOR expressed regret at the announcement of the Colonial Office that they would not allow opium in any form to return to the Straits Settlements. This decision would have the opposite effect to that desired by the Colonial Secretary, because it was quite certain that drug addiction would be far worse since the Japanese had been there. If opium were cut off entirely, with these large numbers of addicts there would be a tremendous black market, and smuggling and law evasion, bringing in drugs in much more dangerous forms, such as cocaine and heroin. This would lead to a worse drug problem, which would have to be tackled again.

Vitamin D for Europe

On June 6 Viscount SUIRDALE asked the Parliamentary Secretary to the Ministry of Economic Warfare in what quantities vitamin D was now being imported into German-occupied countries. Mr. G. H. HALL, who replied, said that the Government agreed to the dispatch of ten kilogrammes of vitamin D in December, 1943, and again in March this year. These twenty kilogrammes were for distribution to children in Belgium, France, Holland, Yugoslavia, and Poland. In addition we agreed, in October, 1943, to let one kilogramme go to Belgium, and last April a quarter of a kilogramme was sent for distribution in the Channel Islands. Before a concession was made in regard to vitamin D, none was imported with our consent into any part of enemy-occupied Europe except Greece, where all the demands of the Neutral Commission had been met.

Voluntary Hospitals in an N.H.S.

Mr. WILLINK told Dr. Russell Thomas on June 8 that he could not then say how frequently routine and special inspections of voluntary hospitals participating in a national health scheme would take place. Details of the arrangements for inspections were matters to be considered at a later stage. Mr. Willink further informed Dr. Thomas that he had not estimated what average proportion the Exchequer grant and the payments of joint local authorities towards the cost of maintenance and treatment of patients would be to the total cost of maintenance and treatment of patients in voluntary hospitals participating in a national health scheme. In the White Paper it was contemplated that, in the hospitals' interests, the aggregate of the central and local payments would be such as still to leave an opportunity for voluntary support. How this could best be arranged remained for discussion with the hospitals' representatives. The British Hospitals Association seemed to think that an opportunity for voluntary support was desirable.

Medical News

Next year will be the bicentenary of the foundation of the world-famous Lying-in Hospital, Dublin, more usually known as the Rotunda Hospital. It has been decided that, on account of war conditions, it would be impossible to commemorate this date in a fitting manner in 1945, and it is proposed to hold in July, 1947, under the auspices of the Rotunda Hospital, a Congress of Obstetrics and Gynaecology in Dublin, which it is hoped that world conditions by then will allow to be of an international nature.

Prof. F. A. E. Crew of the University of Edinburgh will give a lecture under the auspices of the Polish Medical Association in the United Kingdom on "New Problems of Social Medicine," on Tuesday, June 27, at 5 p.m., at B.M.A. House, Tavistock Square, W.C. Visitors will be welcome. The lecture will be followed by a discussion.

The fourteenth annual general meeting of the Paddington Medical Society will be held on Tuesday, June 27, at 9 p.m. in the Board Room of St. Mary's Hospital, W. The title of Dr. Z. Green's presidential address is "Medicine in the Post-War Era."

A meeting of the Nutrition Panel of the Society of Chemical Industry will be held at 2.30 in the rooms of the Chemical Society, Burlington House, W., on Tuesday, June 27, when a series of four papers will be presented on "The Taste and Quality of Food in Relation to Nutrition" by Prof. H. Hartridge, Dr. G. W. Scott Blair, Dr. D. R. Davis, and Mr. R. R. Plowman.

The annual general meeting of the Fever Hospital Medical Service Group of the Society of Medical Officers of Health will be held at Tavistock House, Tavistock Square, London, W.C.1, on Friday, June 30, at 3 p.m. The subject for discussion will be penicillin, and the principal speakers will be Sir A. Fleming ("The Penicillin Content of Blood following Administration by Various Routes") and Dr. A. Dolphin ("Penicillin in the Treatment of Septicaemias and Meningitis").

The Lord Mayor paid an official visit on June 5 to the London Chest Hospital, Victoria Park, E., and before touring the wards inspected plans for rebuilding the hospital, which suffered severe damage during an air raid. The plans provide for a modern building with greatly increased accommodation.

The Oxford Ophthalmological Congress, which was to have been held in July, has been postponed. It is hoped it may be possible to arrange a meeting later in the year.

The meeting of the School Medical Service Group of the Society of Medical Officers of Health to have been held on July 21 has been postponed until further notice. The President of the Board of Education has promised to offer a date for his address to the Group as soon as circumstances permit.

Mr. F. G. Wells, of Hanwell, has been elected president of the Pharmaceutical Society of Great Britain. Mr. Wells is vice-chairman of the Middlesex Pharmaceutical Committee.

EPIDEMIOLOGICAL NOTES

Discussion of Table

In *England and Wales* the only infectious disease that increased markedly in incidence was measles, with 96 more notifications than last week. Notifications of the other infectious diseases decreased by the following amounts: scarlet fever 374, whooping-cough 154, dysentery 87, diphtheria 36.

Diphtheria notifications fell to the lowest weekly total yet recorded. This disease is relatively more prevalent in the north than in the south, and 41% of the total cases were notified in the counties of Yorks West Riding, Lancashire, Durham, and Northumberland, where 70, 69, 34, and 30 cases respectively were recorded. The decline in scarlet fever was general, and the number of notifications was the smallest for over one year. In Lancashire, Warwickshire, and Yorks West Riding whooping-cough notifications fell by 65, 40, and 37 respectively. In London the incidence of whooping-cough rose by 42. The largest increases in measles were in London 54 and Lancashire 47, while the largest fall was in Durham 30.

Dysentery notifications numbered 178, this total being, with one exception, the lowest for seventeen weeks. The highest returns were Lancashire 33, London 24, Warwickshire 18, Glamorganshire 17, Derbyshire 13, Essex 13.

In *Scotland* there were 85 more cases of measles than last week, 78 of acute primary pneumonia, and 60 of whooping-cough. The rise in the incidence of pneumonia was general throughout the country, but measles and whooping-cough were prevalent mainly in Glasgow, where the cases were 68 and 35 respectively more than last week. Glasgow had 24 cases of dysentery, Lanark County 23, and Edinburgh 14; the total for the country rose by 7.

In *Eire* the notifications of measles dropped from 260 to 105. For the third week a case of typhus was notified in Roscommon, Castlerea R.D.

In *Northern Ireland* there was a slight rise in the notifications of measles and scarlet fever. 40 of the 42 cases of measles and 29 of the 60 cases of scarlet fever were reported from Belfast C.B.

Tuberculosis

The mortality from respiratory tuberculosis has fallen during the past two years after rising during the first war years. The female deaths in England and Wales were fewer in 1942 and 1943 than in the immediate pre-war years, but the male deaths were at a slightly higher level in 1942 than in 1938–9. In Scotland both sexes had a higher mortality in 1942–3 than in the pre-war years. Deaths from non-pulmonary tuberculosis in England and Wales have fallen to pre-war level, but they remain above the pre-war total in Scotland. There has been a steady increase in both countries in the notifications of tuberculosis since the outbreak of war. The data for 1938–43 are:

England and Wales

Year	Deaths					
	Pulmonary			Non-pulmonary		
	Male	Female	Total	Male	Female	Total
1938	12,445	8,837	21,282	2,261	1,996	4,257
1939	12,702	8,840	21,542	2,229	1,852	4,081
1940	13,920	9,740	23,660	2,381	2,103	4,484
1941	13,985	9,648	23,633	2,653	2,384	5,037
1942	12,511	8,478	20,989	2,426	2,134	4,560
1943	13,064	8,276	21,340	2,218	2,092	4,310
	Notifications					
1938	21,302	16,577	37,879	6,511	6,299	12,810
1939	19,695	15,235	34,930	5,660	5,616	11,276
1940	20,988	15,163	36,151	5,272	5,149	10,421
1941	23,147	16,352	39,499	5,819	5,646	11,465
1942	23,623	17,006	40,629	5,937	6,053	11,990
1943	—	—	42,458	—	—	11,934

Scotland

Year	Deaths					
	Pulmonary			Non-pulmonary		
	Male	Female	Total	Male	Female	Total
1938	1,396	1,185	2,581	435	416	851
1939	1,506	1,211	2,717	411	398	809
1940	1,669	1,368	3,037	486	480	966
1941	1,646	1,471	3,117	516	542	1,057
1942	1,561	1,482	3,043	473	482	955
1943	1,581	1,395	2,976	473	510	983
	Notifications					
1938	2,603	2,190	4,793	1,369	1,403	2,772
1939	2,432	2,225	4,657	1,202	1,238	2,440
1940	2,720	2,492	5,212	1,240	1,270	2,510
1941	3,002	2,737	5,739	1,255	1,300	2,555
1942	3,272	2,952	6,224	1,342	1,482	2,824
1943	3,730	3,485	7,215	1,408	1,465	2,873

NOTES

Table for England and Wales.—The figures for 1943 are provisional only; separate figures for males and females are not yet available. Comparison of the deaths from pulmonary tuberculosis by age groups in 1943 with those in 1939 shows that increases occurred among children under 15 and among men at each age group over 35, whereas decreases occurred among women of each age group.

Table for Scotland.—Age groups specially affected by recent increases in pulmonary tuberculosis are: under 5 (M. and F.); 10 to 15 (F.); 15 to 25 (M. and F.); and 25 to 35 (M. and F.). There are no age groups specially affected by increases in non-pulmonary tuberculosis.

Week Ending June 10

The notifications of infectious diseases in England and Wales during the week included: scarlet fever 1,428, whooping-cough 2,473, diphtheria 470, measles 3,078, acute pneumonia 738, cerebrospinal fever 66, dysentery 181, paratyphoid 3, typhoid 1.

No. 22

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended June 3.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for: (a) England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland.

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for: (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases; a blank space denotes disease not notifiable or no return available.

Disease	1944					1943 (Corresponding Week)				
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)
Cerebrospinal fever	71	3	32	—	3	79	7	31	5	6
Deaths		2	1				2	—		
Diphtheria	471	21	124	53	21	630	37	160	66	31
Deaths	10	1	2	6	1	9	3	7	—	—
Dysentery	187	24	95	—	—	125	8	35	—	2
Deaths				—	—				—	—
Encephalitis lethargica, acute	2	—	1	—	—	6	—	—	—	—
Deaths		—					—			
Erysipelas			49	10	3			47	9	—
Deaths		1					—			
Infective enteritis or diarrhoea under 2 years				10					33	
Deaths	45	5	13	10	5	51	13	4	13	6
Measles	2,758	271	514	105	42	7,668	365	517	23	44
Deaths	1	1	1	—	—	1	—	1	—	1
Ophthalmia neonatorum	82	4	22	—	—	107	10	30	1	1
Deaths										
Paratyphoid fever	2	—	—	2(B)	—	6	—	2	—	—
Deaths	—	—	—	—	—	—	—	—	—	—
Pneumonia, influenzal*	794	61	7	4	5	768	42	5	2	15
Deaths (from influenza)	14	2	—	—	—	6	—	2	—	—
Pneumonia, primary			284	24				213	20	
Deaths		34		6	5		19		6	8
Polio-encephalitis, acute	—	—				2	—			
Deaths		—					—			
Poliomyelitis, acute	4	1	5	—	—	5	—	1	—	—
Deaths		—					—	—		
Puerperal fever		2	20		—		3	9		—
Deaths							—			
Puerperal pyrexia†	195	8	12	2	2	169	16	26	2	2
Deaths		—								
Relapsing fever	—	—			—	—	—			—
Deaths										
Scarlet fever	1,479	92	206	23	60	1,921	168	220	54	54
Deaths	1	1	—	—	—	—	—	1	—	—
Smallpox	—	—	—	—	—	—	—	—	—	—
Deaths				—	—				—	—
Typhoid fever	6	—	2	5	—	4	—	1	10	1
Deaths	—	—	—	—	—	—	—	—	—	—
Typhus fever	—	—	—	1	—	—	—	—	—	—
Deaths				—	—				—	—
Whooping-cough	2,273	283	210	27	15	2,144	151	226	17	46
Deaths	23	6	2	—	—	11	—	3	—	1
Deaths (0–1 year)	345	45	61	27	24	310	48	67	38	23
Infant mortality rate (per 1,000 live births)										
Deaths (excluding still-births)	4,190	617	590	195	127	3,949	556	573	199	127
Annual death rate (per 1,000 persons living)			13·6	12·6	‡			12·9	13·1	‡
Live births	6,754	832	956	486	309	6,501	762	1,041	431	321
Annual rate per 1,000 persons living			19·4	—	‡			21·3	28·3	‡
Stillbirths	231	26	36			228	22	23		
Rate per 1,000 total births (including stillborn)			36					22		

* Includes primary form for England and Wales, London (administrative county), and Northern Ireland.

† Includes puerperal fever for England and Wales and Eire.

‡ Owing to evacuation schemes and other movements of population, birth and death rates for Northern Ireland are no longer available.

Letters, Notes, and Answers

All communications with regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, LONDON, W.C.1. TELEPHONE: EUSTON 2111. TELEGRAMS: *Aitiology Westcent, London.* ORIGINAL ARTICLES AND LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone unless the contrary be stated.

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ANY QUESTIONS?

Aetiology of Bronchiectasis

Q.—*In reply to a query on the subject of bronchiectasis (Dec. 11, p. 771) it was stated that it was questionable whether inflammatory changes could be considered the primary cause of the condition. Could you inform me what alternative views are held regarding its aetiology? In my student days some 40 years ago bronchiectasis, a morbid condition obtrusively recognizable without recourse to radiography, was almost a rarity, but soon afterwards suddenly became common throughout the world.*

A.—Your correspondent appears to have read into this answer rather more than is justified. I think that the distinction which was drawn was between pathological states rather than causes. There is, however, much controversy about the basic cause of bronchiectasis. There are two main theories: (1) that the infection of the bronchi is the primary cause and that collapse or consolidation of the lung is an adjuvant or secondary effect; and (2) that collapse of part or the whole of a lobe produces a condition of dilatation which is made permanent and symptom-producing by subsequent infection. The evidence is discussed very fully in *Bronchiectasis* by Lisa and Rosenblatt (Oxford Medical Press, 1943), which is in the B.M.A. library. The very great apparent increase in the incidence of the disease is due to the fact that before the introduction of bronchography with lipiodol only very advanced cases could be diagnosed.

Some Facts about Dysentery

Q.—*It was stated in your leader entitled "An Increase in Diarrhoeal Disease" (Jan. 29, 1944, p. 155) that there had been a big increase in the notifications of dysentery, and I see that the notification figure in the weekly epidemiological table shows no tendency to fall. Presumably in summer months it may even show a tendency to rise. Would it be possible to answer briefly the six questions I send?*

A.—1. *What is the usual mode of spread?* Infectivity is high and the organism may be spread in a variety of ways: (*a*) from case to case, as when an infected person, after using the lavatory, soils the seat or the handle of the flushing cistern; or, without washing his hands, proceeds to contaminate food, cutlery, drinking vessels, etc.; (*b*) as an explosive outbreak when an infected food-handler contaminates milk or milk products or other prepared foods; (*c*) contamination of food by flies.

2. *Is there an animal reservoir of infection?* No: except that infected flies may carry the organism for 24 hours.

3. *How is infection maintained in the community?* (*a*) By the missed mild case. (*b*) By the convalescent carrier, whom modern cultural methods have shown to be very common and who may continue to excrete the organism for weeks after he is clinically well. (*c*) By the healthy contact carrier, of whom there is always a fair proportion in any outbreak.

4. *What are the symptoms and duration of the mild form likely to be missed?* Both Flexner and Sonne infections occur in mild atypical form without blood or mucus in the stools; the symptoms may be diarrhoea or relaxed stools for one day only.

5. *What is the treatment—dietetic, drug, isolation?* (*a*) Light restricted diet—e.g., predigested milk foods—until the diarrhoea ceases. (*b*) The safest drug is sulphaguanidine, 4–6 g. daily for a child, and 9–12 for an adult, given 4-hourly during the day. Begin treatment as early as possible and reduce to half doses after 4 days; continue for 3 more days. Good results are also obtained with sulphapyridine or sulphathiazole. Adequate fluids must be given. (*c*) Isolation at home or in hospital is essential where there are other, particularly younger, children in the household.

6. *If the disease is generally mild, is the use of sulphonamides justifiable?* In mild infections sulphonamide therapy is required to obtain bacteriological cure as early as possible and so minimize the risk of spread. Sulphaguanidine will do this in Flexner infections; sulphapyridine or sulphathiazole is more effective in Sonne infections. The earlier treatment is begun, the better the chance of bacteriological cure. Intimate family contacts may be protected by small daily doses (2–3 g.) of sulphaguanidine.

Still More about Threadworms

Q.—*Some textbooks state that Enterobius vermicularis does not multiply in the intestine, and that it is necessary for the eggs containing embryos to be swallowed to produce a fresh crop of adult worms. If this is true and reinfection is prevented, it is difficult to understand why a spontaneous cure should not occur, whereas it is stated in an answer to a question in the JOURNAL of March 25 last (p. 445) that "treatment is proverbially unsatisfactory."*

A.—The difficulty is to prevent reinfection. The gravid females crawl out of the anus at night and lay their eggs in the peri-anal region, the larva within the egg becoming infective within 12 hours. The migration of the females causes an intense itching, which invariably leads to scratching of the infected region, often during sleep; as a result the fingers become contaminated with the eggs, which are afterwards carried to the mouth and swallowed.

Operation for Acute Appendicitis

Q.—*Why do some surgeons nowadays appear to make a practice of never operating upon cases of acute appendicitis? From a pathological point of view it seems all wrong. There must be a large number of people who have had an attack who still have their infected appendix inside them. Is it a passing phase to "sit on" acute cases, or have we returned to pre-Edwardian days? The surgeons who do this would probably not "sit on" an acute mastoid.*

A.—Many cases of acute appendicitis will resolve if the intestine is put completely at rest. Some, however, will develop complications; and, since nobody can tell in the early stages of the disease to which group the case may belong, very few surgeons make a practice of never operating upon acute appendicitis.

From the pathological point of view it is interesting to note that resolution, even after abscess formation, means a return to a state so closely approximating to the normal that within a few weeks (on the average about six weeks) the caecum and appendix appear healthy at laparotomy. Furthermore, there is little resemblance between this condition and mastoiditis, for in any bone infection there is a risk of spreading phlebitis, which is fortunately such an uncommon event in appendicitis.

The conservative treatment of carefully selected cases of acute appendicitis cannot be regarded as a passing phase; and to suggest that it may be a return to the age when appendicitis was little understood shows a lack of appreciation of the modern conception of the response of the body to acute infection.

Anaesthesia for Torn Perineum

Q.—*We have been told a good deal lately of the danger of using spinal anaesthesia in labour. Does the danger still exist if a low spinal anaesthetic is given for sewing up a torn perineum?*

A.—General anaesthesia is unnecessary for the repair of small perineal tears. Local anaesthesia in the form of 1% procaine is simple, safe, and effective. For extensive tears involving the anal sphincter a general anaesthetic is usually required. In view of the circulatory adjustments that follow the completion of the third stage of labour, anaesthesia (such as spinal) that lowers the blood pressure should be avoided; furthermore the risk of meningitis after lumbar puncture has always to be considered.

Risk of Embolism in Labour

Q.—*A woman of 41 is expecting her first child at the end of July. She is very stout; her blood pressure varies from 110/80 to 130/80. She has marked varicose veins on both legs. She has had headaches of a migraine type (severe and frequent attacks) before and at the beginning of her pregnancy, but not so many recently. Her own mother died from embolism after confinement. (1) Would heparin be indicated to prevent embolism after her confinement, or would its administration endanger her by interfering with the necessary clotting at the site of the placenta, as it extends the coagulation time? (2) What would the dosage and mode of administration be, and when would treatment have to begin? Is there any other prophylactic treatment for such a case?*

A.—This patient would not appear to be an ideal obstetrical type. Her blood pressure, however, is reassuring. The present position in regard to the use of heparin in this type of case is not sufficiently clear to permit its use to be freely advocated. There are dangers, and if the treatment were to be given it should be done in a well-equipped institution with adequate pathological facilities, where daily progress could be supervised by specialists. An older but better line of treatment would be to concentrate during the ante-natal period on raising the haemoglobin to its maximum level; for anaemia would, of course, be a predisposing factor in bringing about subse-

quent thrombosis and embolism. Once the child is delivered the mother must be encouraged to move about actively in bed, and even if an episiotomy is performed or a tear is sustained she should be encouraged to move her legs and thus maintain adequate circulation. The use of an efficient masseuse to supervise active movement and massage would be a great help. A factor in this case which should not be overlooked in a primigravida of 41 is the natural anxiety she must have in view of the nature of her mother's death. Encouragement throughout her ante-natal period will do a great deal to lessen her fears and, as a result, the chance of inertia occurring. This is the more necessary as any prolongation of her labour or excessive interference will be likelier to precipitate a subsequent thrombosis.

Grenz Rays

Q.—*Some time ago, in reply to a question on leucodermia, it was stated that Grenz rays sometimes proved beneficial. I have made inquiries among colleagues (including radiologists), but have been unable to obtain any information about them, or about anyone with the necessary apparatus and skill.*

A.—Very low voltage (or infra-Roentgen) rays were first studied by Schultz in 1911 in the treatment of some skin diseases. Their use was developed and popularized by Bucky (*Grenz Ray Therapy*, trans. 1929). Grenz rays are nearer *x* rays than ultra-violet; their wavelength is about 2 Angström, produced at about 10 kV. The tube has a lithium glass window (glass of a low density) to allow passage of the rays. Almost all the rays are absorbed in the epidermis, so local applications may be useful in superficial dermatoses, especially when any deeper effect is to be avoided, as in the scrotum or eyelids. Bucky and others have also reported, by general trunk irradiation, distant effects on many diseases in which an endocrine or autonomic nervous system factor may be involved, as in asthma, arthritis, angioneurotic oedema, urticaria, and allergic dermatitis. These observations require confirmation. Many of the complaints listed have sometimes responded also to other forms of irradiation, as ultra-violet and small doses of *x* rays to the trunk, in continued series of sessions, with frequent blood counts as a check. Bucky's results, if confirmed, support the theory that the skin acts in part as an endocrine gland, and they increase the already wide, but largely unexplored, field of indirect radiotherapy, which has its greatest scope of accepted usefulness in the results of heliotherapy or ultra-violet light therapy (general) in tuberculosis, when associated with other hygienic measures. Bucky's papers in the *Medical Record* (1935, **142**, 71, 109, and 165) summarize the general effects of Grenz rays in alopecia, vitiligo, and other conditions, as well as those above mentioned.

B.C.G. Vaccine

Q.—*What is B.C.G. vaccine? Is it obtainable at the present time commercially? Is it likely to be of use for immunizing a native population in the Tropics which is being attacked by tuberculosis? Can you tell me where detailed information for its use can be found?*

A.—A suspension of living tubercle bacilli of the strain known as Calmette-Guérin bacillus, which by prolonged artificial cultivation on unfavourable media has been rendered almost completely avirulent and incapable of causing progressive disease even in the highly susceptible guinea-pig. It has been administered by the mouth to infants, mainly in France, and by subcutaneous injection to both children and adults. There is sound experimental evidence that it will increase the resistance of guinea-pigs and calves to infection with virulent tubercle bacilli, and some clinical evidence of protection in human beings, notably among nurses in Scandinavia. The questioner is referred to the *Journal* of Dec. 4, 1943, which contains a report of a discussion on this subject at a meeting of the Tuberculosis Association, and editorial comments thereon. The numerous original papers of French, Scandinavian, and American authors should be consulted for details. The immunization of a susceptible native population exposed to infection is decidedly a proper field for employing B.C.G. vaccine. It is not obtainable commercially in England, and should in any case preferably be prepared in the country in which it is to be used, since, like all preparations of living micro-organisms, it has a short effective life.

Sterilization of Syringes

Q.—*What is the best solution to use for sterilizing hypodermic syringes and needles and keeping them sterile in spirit-proof cases? The ideal solution for practical purposes would (1) sterilize in about 5 minutes, (2) maintain sterility for several days or weeks without spoiling or corroding. Would a 2% solution of dettol in methylated spirit fulfil these objects?*

A.—We know of no evidence that any feasible chemical method can be relied on for disinfecting a contaminated syringe. Any syringe which has been used for a septic purpose should always be sterilized by heat. On the other hand, a syringe kept only for aseptic purposes, such as the injection of sterile medicaments through normal skin, should not require repeated disinfection by an infallible method in the ordinary circumstances of careful use. If safety is to be combined with reasonable convenience, a distinction must be made between different types of use, sterilization by heat being always regarded as the only perfectly reliable method, and imperatively called for when contamination is known or suspected, or when the risk, even if remote, is great, as in mass inoculation.

Mode of Action of Aspirin

Q.—*Would you give me a summary of the mode of action of aspirin?*

A.—The full chemical explanation of the action of aspirin is still unknown, but the following facts have been established. Aspirin lowers the temperature in fever by acting on the centres in the hypothalamus which regulate heat loss. The temperature falls because of increased heat loss, due to sweating and to dilatation of the skin vessels. These changes do not occur if the temperature is normal. Aspirin causes a small fall of the metabolic rate, but does not lower the temperature of normal persons unless toxic doses are used. Aspirin also has a mild analgesic effect due to an action on the brain, and, like other derivatives of salicylic acid, it reduces the swelling of the joints in rheumatic fever. Very large doses cause restlessness, delirium, and convulsions, followed by coma and death, but absorption is slow and lives can be saved by washing out the stomach. A few persons have an idiosyncrasy for aspirin, so that comparatively small doses cause an allergic response in the form of asthma, vasodilatation, or urticaria.

LETTERS, NOTES, ETC.

The Tavistock Clinic

The Tavistock Clinic (Institute of Medical Psychology), at present housed at Hampstead, reports a year of as great activity as a depleted staff will permit. Only in one previous year in the Clinic's history was the number of those applying for advice and treatment as great as in 1943. In the adult department the types of complaint which have brought the patients to seek advice have shown no marked changes, but whatever the specific condition, depression is usually present to some extent. This is thought to be the result of the cumulative effect of fatigue, frustration, and exhaustion. While it is only for a minority that wartime conditions amount to a real burden affecting health, the margin for many of the remainder is narrowing, and any additional strain may be felt to be intolerable. The number of adult attendances in 1943 was 6,410, and of child attendances 3,807, and as each interview lasts normally an hour, the strain on the small staff can be imagined. Intelligence tests have been carried out on the children who for various reasons have been referred to the Clinic. Half of them have been found to be of average ability, compared with approximately 75% in a normal sample of the population; 30% of the children were found to be above the average. This confirms the belief that psychological problems arise to a greater extent in those of unusually good or unusually poor ability, with, in the Tavistock Clinic experience, the balance weighted slightly towards the higher level.

Vomiting of Pregnancy

Dr. W. I. HARDY (Vibthwaite, Nr. Ulverston) writes: I have read with interest the letters of Drs. Calvert and Edwards regarding the aetiology and treatment of vomiting of pregnancy. Dr. Calvert (June 3, p. 772) supports the theory that the digestive disturbances of pregnancy may be due to the high blood level of progesterone. I have noted that injections of progesterone—given to assist or prevent abortion—may apparently initiate nausea and vomiting in patients who had not yet developed this symptom. This may, of course, be a coincidence, as they were given during the first three months. Nausea and vomiting if previously present have become more severe for a short period following the progesterone injections. Certainly injections of oestrin appear to benefit one-third to one-half of cases of indigestion in pregnancy. Unfortunately for the endocrine theory of causation of symptoms, these do not always respond to endocrine therapy.

Fasciculating Muscles

As one reader has misunderstood a sentence in the answer to a question under the above heading in the *Journal* of June 10 (p. 801), other readers may have erred similarly. The sentence read as follows: "Although it is rare, the condition is well recognized by neurologists, to whom it is usually referred as amyotrophic lateral sclerosis." To make the matter explicit for the hurried reader, the second half of the sentence should perhaps have read, "... to whom it is usually referred *with the wrong diagnosis* of amyotrophic lateral sclerosis."

The shilling pamphlet entitled *A Reading List for Relief Workers* noticed on June 10 (p. 785) is not published by the Oxford University Press but by the Royal Institute of International Affairs, Chatham House, 10, St. James's Square, London, S.W.1.

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BRITISH MEDICAL JOURNAL

JOURNAL OF THE BRITISH MEDICAL ASSOCIATION

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BRITISH MEDICAL ASSOCIATION, TAVISTOCK SQUARE, LONDON, W.C.

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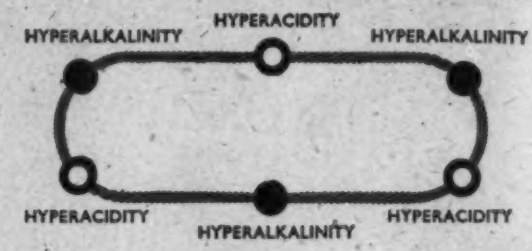

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IMPORTANT—All applicants should read the notice about qualifications required, etc., printed at the top of page 13

ANCOATS HOSPITAL, Manchester, 4. HOUSE SURGEON (A).—Applications are invited from registered medical practitioners, male or female, for the appointment of a House Surgeon (A), to become vacant at the end of July, including practitioners within three months of qualification who are liable to service under the National Service Acts. Appointment for six months. Salary £120 per annum, with full residential emoluments. Applications, stating age, qualifications, and full particulars, to be forwarded to the undersigned on or before June 30 next.—Herbert J. Dafforne, Gen. Supt. and Sec.

CONNAUGHT HOSPITAL, Orford Road, Walthamstow, E.17. CASUALTY OFFICER (A post).—Applications are invited from registered medical practitioners, male and female, for the appointment of Casualty Officer, including practitioners within three months of qualification who are liable to service under the National Service Acts. If held by a practitioner who is liable under these Acts, the appointment will be for a period of six months. Salary at the rate of £175 per annum, with full residential emoluments. Applications to be sent to the undersigned as soon as possible.—R. Halton Harrison, Secretary.

GRIMSBY AND DISTRICT GENERAL HOSPITAL (237 beds).—Applications are invited from registered medical practitioners, male or female, for the post of RESIDENT CASUALTY OFFICER AND HOUSE SURGEON (A), including practitioners within three months of qualification and liable under the National Service Acts. Appointment for six months. Salary at the rate of £175 per annum, with full residential emoluments. Applications to the Secretary-Superintendent.

HULL ROYAL INFIRMARY.—Applications are invited from registered medical practitioners for the posts of two CASUALTY OFFICERS (A), vacant now. Duties in the Casualty and Out-patient Departments and some ward work. Candidates may include practitioners within three months of qualification who are liable to service under the National Service Acts. If held by practitioners who are liable under these Acts appointment will be for a period of six months. Salary is at the rate of £200 per annum, with full residential emoluments. Applications to R. J. Carle:, House Governor.

LEIGH INFIRMARY, Lancs (General Hospital, 102 beds).—Applications are invited from registered medical practitioners, male and female, for the appointment of a HOUSE SURGEON (A), vacant immediately, including practitioners within three months of qualification who are liable to service under the National Service Acts. If held by a practitioner who is liable under these Acts, appointment will be for a period of six months, otherwise it will be for a period of twelve months. Salary is at the rate of £200 per annum, with full residential emoluments. Applications from friendly alien practitioners are also invited. Applications to be addressed to F. M. Evison, Acting Secretary.

MONTAGU HOSPITAL, Mexborough, Yorks (123 beds).—Applications are invited from registered medical practitioners, male, for the appointment of HOUSE SURGEON (A), now vacant. Commencing salary at the rate of £200 per anum, with usual residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for a period of six months. Applications to A. W. Young, Secretary-Supt.

MANCHESTER ROYAL INFIRMARY.—The Board of Management of the Manchester Royal Infirmary invite applications from registered medical practitioners, male and female, including R practitioners within three months of qualification for the following A appointments: 4 HOUSE PHYSICIANS two for July 8 and two for July 22. 6 HOUSE SURGEONS, one for July 3, and for July 8, three for July 12, and one for July 22. 1 HOUSE SURGEON for Aural, Gynaecological, Ophthalmic, and Dermatological Departments. 2 HOUSE SURGEONS for Neuro-surgical Department, one for July 3, and one now vacant. 1 HOUSE SURGEON for Orthopaedic Department for July 3. If applying for more than one of the above posts, candidates should state the order of their preference. Appointments are for six months, subject to the provisions of the byelaws as to notices, etc. Salaries at the rate of £75 per annum with the usual residential emoluments. Applications, stating nationality, age, and qualifications, to be sent to the Chairman of the Medical Board not later than July 3, 1944.—F. J. Cable, General Superintendent and Secretary.

ROYAL ALBERT EDWARD INFIRMARY AND DISPENSARY, Wigan.—Applications are invited from registered medical practitioners, male, for the appointment of TWO HOUSE SURGEONS (A), now vacant, including practitioners within three months of qualification who are liable to service under the National Service Acts. If held by practitioners who are liable under these Acts, appointments will be for a period of six months, otherwise they may be extended for a further period. Salary in each instance is at the rate of £150 per annum, with full residential emoluments. Applications should be sent to the undersigned as soon as possible.—A. Stanley Brunt, General Superintendent and Secretary.

NEWARK TOWN AND DISTRICT HOSPITAL (70 normal beds).—Applications are invited from registered medical practitioners, male and female, for the appointment of HOUSE SURGEON (A), to become vacant on July 1. Salary is at the rate of £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months.—B. C. Dion, Sec.-Supt.

OLDHAM ROYAL INFIRMARY. HOUSE SURGEON (A).—Applications are invited from registered medical practitioners, male and female, for the appointment of a House Surgeon (A), to become vacant immediately. Practitioners within three months of qualification and liable under the National Service Acts may apply, and the appointment will be for a period of six months. The salary is at the rate of £175 per annum, with full residential emoluments. Applications to be submitted to the undersigned.—F. W. Barnett, General Superintendent and Secretary.

ROYAL CORNWALL INFIRMARY, Truro (351 beds, 5 residential).—Applications are invited from registered practitioners, male or female, for the appointment of HOUSE SURGEON (B2) to the Ophthalmic and Ear, Nose and Throat Departments (recognized for the D.L.O.), with some general surgical duties. Vacant July 1. Salary is at the rate of £200 p.a., with full residential emoluments. R and W practitioners who now hold A posts may also apply, when appointment is limited to six months. Applications should be addressed to the Secretary.

ROMFORD JOINT HOSPITAL BOARD. Rush Green Emergency Hospital, Romford. TEMPORARY SENIOR ASSISTANT MEDICAL OFFICER (B1).—Applications are invited from registered medical practitioners, male and female, for the above appointment, during the absence of the holder in His Majesty's Forces. The Hospital contains 215 E.M.S. beds and 90 fever beds. Applicants should have held a house appointment and preference will be given to those with experience of fevers. Suitably qualified R and W practitioners holding B2 appointments are invited to apply. Applications from R practitioners now holding B1 appointments cannot be considered unless they have been rejected by the R.A.M.C. Salary is at the rate of £350 by £25 to £450 per annum, plus the usual emoluments and bonus as recommended by the Whitley Council. Appointment is subject to one month's notice on either side. Applications, stating name, age, nationality, qualifications and experience, together with copies of two testimonials, to be addressed to the Medical Superintendent, not later than Wednesday, June 28, 1944.—Ernest E. Taylor, Clerk of the Board, Clerk's Office, Rush Green Hospital, Romford.

STRATFORD-ON-AVON EMERGENCY HOSPITAL, County of Warwick. RESIDENT SURGICAL OFFICER (B1).—Applications are invited from registered medical practitioners for the appointment of Resident Surgical Officer (B1), which will become vacant on August 1 next. Applicants should have held house appointments and had surgical experience. Suitably qualified R and W practitioners holding B2 appointments are invited to apply. Applications from R practitioners now holding B1 appointments cannot be considered unless they have been rejected by the R.A.M.C. Salary is at the rate of £300 per annum, with full residential emoluments. The appointment is limited to a period of one year. Applications, on forms to be obtained from the Public Assistance Officer, Shire Hall, Warwick, should, on completion, be returned to him not later than July 4, 1944.—I. Edgar Stephens, Clerk of the Council, Shire Hall, Warwick.

ST. AUDRY'S HOSPITAL, Melton, Woodbridge, Suffolk.—TEMPORARY ASSISTANT MEDICAL OFFICER required for the above, which is the County Mental Hospital and also a class 1A E.M.S., Hospital with 100 beds (B1 post). R practitioners holding B2 posts, also R practitioners holding B1 posts and rejected by the R.A.M.C. may apply. Salary 8 guineas per week, and board residence. Apply Medical Superintendent and enclose copies of two testimonials.

ST. BARTHOLOMEW'S HOSPITAL, Rochester (201 beds).—Applications are invited from registered medical practitioners for post of CASUALTY OFFICER (A), vacant now. Salary £150 per annum (plus E.M.S. grant of approximately £50 per annum), with full residential emoluments. Practitioners within three months of qualification and liable under National Service Acts may also apply, when appointment will be for a period of six months. Applications to be forwarded to the Superintendent-Secretary as soon as possible.

TORBAY HOSPITAL, Torquay (beds, 223).—Applications are invited from registered medical practitioners, male and female, for appointment on July 1 (or earlier) as HOUSE SURGEON (A). Salary is at the rate of £175 p.a., with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months, otherwise for six months, renewable at the pleasure of the Committee. Applications, with full particulars, to E. L. Grist, Secretary.

ALTRINCHAM GENERAL HOSPITAL.—Applications are invited from registered medical practitioners, male and female, for the following appointments, vacant July 18: HOUSE SURGEON (B2). R and W practitioners holding A posts may also apply, when appointment will be limited to six months, otherwise with option for a further period of six months. HOUSE SURGEON (A). Practitioners within three months of qualification and liable under the National Service Acts may apply, when appointment will be for a period of six months, otherwise with option of a further six months. Salary in both cases at the rate of £150 p.a., with full residential emoluments. Applications should be sent as soon as possible and addressed to General Superintendent-Secretary, Altrincham General Hospital, Altrincham, Nr. Manchester.

SUTTON AND CHEAM GENERAL HOSPITAL, Sutton, Surrey (75 beds normal, plus 75 emergency). SENIOR RESIDENT MEDICAL OFFICER (B2).—Applications are invited from registered medical practitioners, male or female, for the appointment of Senior Resident Medical Officer, to become vacant immediately, including R practitioners who now hold A posts. The appointment will be limited to six months. The salary is at the rate of £200 per annum, with full residential emoluments. Applications should be sent to the Secretary.

ST MARY'S HOSPITAL, W.2. SURGICAL REGISTRAR (B1).—Applications are invited for the above post from registered medical practitioners who are Fellows of the Royal College of Surgeons of England. Suitably qualified R and W practitioners holding B2 posts may apply. Applications from R practitioners now holding B1 appointments cannot be considered unless they have been rejected by the R.A.M.C. The successful candidate will be required to hold a contract under the E.M.S., at a salary of not less than £350 per annum. The appointment is for a first period of twelve months as from a date to be arranged. Applications should reach the undersigned on or before Wednesday, June 28, 1944.—W. Parkes, House Governor.

THE SOUTHAMPTON CHILDREN'S HOSPITAL AND DISPENSARY FOR WOMEN.—Applications are invited from registered medical practitioners, men or women, for the appointment of RESIDENT MEDICAL OFFICER (A), vacant now. Salary is at the rate of £200 per annum, with full residential emoluments. Practitioners within three months of qualification and liable under the National Service Acts may also apply, when appointment will be for six months. Applications should be sent immediately to Ella K. Matthews, Secretary.

THE ROYAL HOSPITAL, Wolverhampton (Incorporated under Royal Charter) (310 beds).—Applications are invited from registered medical practitioners, male or female, for the appointment of RESIDENT ANAESTHETIST (B2), vacant now, including R and W practitioners who now hold A posts. If held by an R or a W practitioner the appointment will be limited to six months, otherwise it will be for a period of twelve months. Salary is at the rate of £200 per annum, with full residential emoluments.

Applications are invited from registered medical practitioners for the appointment of a HOUSE SURGEON (A), vacant now, including practitioners within three months of qualification who are liable to service under the National Service Acts. If held by a practitioner who is liable under these Acts, appointment will be for a period of six months. Salary is at the rate of £100 per annum, with full residential emoluments.

Applications are invited from registered medical practitioners, male, for the appointment of CASUALTY OFFICER (B2), vacant now, including R practitioners who now hold A posts. If held by an R practitioner the appointment will be limited to six months. Salary is at the rate of £150 per annum, with full residential emoluments.—W. Cockburn, House Governor.

THE HOSPITAL OF ST. CROSS, Rugby (beds: Normal 160, E.M.S. 55). RESIDENT SURGICAL OFFICER (B1).—Applications are invited from registered medical practitioners, male and female, for the appointment of Resident Surgical Officer, to become vacant on July 1, 1944. Applicants should have held house appointments and had surgical experience. Preference will be given to candidates holding the Diploma of F.R.C.S. Applications from male R practitioners now holding A or B2 posts cannot be considered unless they have been rejected by the R.A.M.C. Commencing salary will be at the minimum rate of £300 to £350 per annum, according to experience, with full residential emoluments.

Applications are invited from registered medical practitioners, male or female, for the appointment of RESIDENT MEDICAL OFFICER (A), vacant August 1, including practitioners within three months of qualification and liable to service under the National Service Acts. If held by a practitioner liable under these Acts, appointment will be for six months. Salary at the rate of £175 per annum, with full residential emoluments. Appointment gives opportunity of general experience in all subjects, and the successful applicant will be attached to the medical wards as House Physician and will also be attached to the Maternity Department. Applications to be sent immediately to Harvey Race, F.C.I.S., F.H.A., Superintendent and Secretary.

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